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GAS JOURNAL

LIGHT ✦ HEAT ✦ POWER ✦ BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

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VOL. CLXI., No. 3116.] WEDNESDAY, JANUARY 31, 1923. [75TH YEAR.

EDITORIAL NOTES.

The Therm Inquiry—Evidence Concluded.

THE Committee finished the hearing of evidence last Friday; and as will be seen by the report in this issue of the "JOURNAL," they had a full sitting, and wound-up with valuable testimony and explanation by Dr. Charles Carpenter, who appeared in two capacities—as Chairman of the Gas Companies' Protection Association, and as the President of the South Metropolitan Gas Company. Mr. R. W. Edwards, the Vice-Chairman of the Gas Companies' Protection Association, also supplied much of interest. We are unable to-day to make extended comment upon the proceedings, but hope to return to them next week. We should, however, at once like to remark that the witnesses named countered point by point the allegations and complaints that have been levelled against the industry and its methods. There were other witnesses who were not on the side of the industry, but they were not there to question the validity of the therm as a basis of charge. Really we still completely fail to see why it was ever considered that there was such dissatisfaction abroad that it was necessary to hold an inquiry by a Departmental Committee. At the same time we do not regret that it has been held, as it has disclosed the hollowness of the whole newspaper agitation. During Dr. Carpenter's evidence, the Chairman made two striking statements. One was that the Committee were not under the impression that an increase in the price of gas had been camouflaged by the introduction of the therm; and, as to the question of standard prices having been fixed too high, he remarked that that was not germane to the inquiry, and need not be bothered about.

The Revised Gas Undertakings Returns.

VERY heartily we congratulate the Board of Trade upon the comprehensiveness and the value of the particulars contained in Part I. of the reconstructed Gas Undertakings Returns. We have done with the old form, and are now on with the new; and we feel confident that our appreciation of the latter will be generally endorsed in the gas industry. The year 1921 marks the parting of the ways between the old conditions in the industry and the new; and therefore the Board took quite the correct course in there and then scrapping the old style of returns, and introducing the new—not only with the view of making them conform to the conditions as modernized by the Gas Regulation Act, but of adding considerably to their technical usefulness. In future, the division of the returns is not to be as between statutory companies and local authorities, but as between manufacturing and selling details in Part I. and financial details in Part II. Given the choice between the old and the new arrangement, we should prefer the latter, though the critics will be deprived of the facility previously existing for instituting investigation of total results respectively under municipal and company administration, and making comparisons that did nobody any good, and were not effective in accomplishing any change. Another alteration is that the Board of Trade have no longer any jurisdiction with respect to Irish undertakings; so that these returns deal only with Great Britain. It is fortunate the two changes occurred almost simultaneously. But the latter one prevents, without some trouble, any contrast between the totals in the present returns and those in the old form. In short, we have to start afresh, and take Part I. as inaugurating an altogether new condition of affairs.

In the circumstances of making a beginning with the new returns during a year in which the industry was entering upon a transition stage (which stage in 1923 has not come to an end), it cannot be expected that the data are anything like complete in some respects—particularly in the matter of the calorific value actually supplied, and the therms made and sold. One cannot bring about an industrial revolution in a few months; and in 1921 many undertakings that had declared their calorific power had not (or the responsible testing authorities had not) the means of making calorimetric tests of the gas supplied. Many, however, that had not those means then will have them now; but we must expect that, at any rate, two or three years will have to elapse before we get anything like completeness in the therm returns. That is inevitable. Nevertheless, we are glad the Board made a beginning with the revised returns at the start of the change under the Gas Regulation Act, and a beginning on which they can develop until a finished statement is permitted by the perfecting of the calorific value testing machinery of the country.

There is one other point we desire at once to make. It is that Part I., which gives manufacturing and selling statistics, relates to the year 1921, when everything was abnormal for the gas industry owing to the three months' coal stoppage. We particularly make this point because it is quite likely the carbon monoxide agitators (who are fond of telling the public the percentages of CO in water gas and coal gas, without mentioning the percentage in the distributed mixture) will pounce upon and quote the figures shown under the heading of "Proportion of Water Gas Supplied in Gas: (*a*) Maximum; (*b*) Average." In that remarkable year, the maxima sometimes ascended to 100 p.ct. water gas. Not uncommon maxima were 40 to 60 p.ct.—that year; but they are not the maxima for normal years. On p. 2 of the returns, there is Aldershot showing a maximum of 100 p.ct.; but an average of only 20·5 p.ct. On the next page, Batley also shows 100 p.ct. as a maximum figure, with 12 p.ct. as an average. That was a year when Government instructions as to a reversal of the positions of coal and water gas had to be obeyed, and, apart from them, when in some instances it was water gas or no fuel. So water gas it was. People were glad enough to get it; and many did not even know a change had been made. During those months of a high proportion of water gas, and therefore exceptional carbon monoxide content, fewer suicides had recourse to gas than has been the case since pragmatics and publicity have offered so much suggestion.

Part I. of the new order of returns even now gives a remarkable amount of exceedingly interesting information, which will enable all sorts of calculations as to workings and sales to be made. Naturally the first column is very incomplete. Declarations of calorific value are given in the case of 184 undertakings; but in the year 1921 very few official tests had been, or could be, made to show the average calorific values. A different state of things will be progressively shown. It may be noted, however, that in the case of Ipswich the average official tests showed an average of B.Th.U. supplied in excess of the declared value of 16·1; Liverpool, 18; Newark, 19; Oxford, 8; Rugby, 12·67; South Metropolitan Gas Company, 3·4; and Wrexham, 10·6. The South Metropolitan Company worked closer to their declared value than any of the other concerns named. Upon the percentages of water gas presented in the next column, comment has already been made. We welcome the

figures as to the total materials used in the manufacture of gas. Now we have not only data as to coal carbonized, but as to coke and oil used in making water gas. But here again one cannot, in view of the coal stoppage, take these coke and oil figures as representing anything like the operations in these respects of a normal year. The gallons of oil consumed were largely governed by circumstances. Where the oil was in store, or could be secured, no doubt a higher proportion was used in some cases per 1000 c.ft. of water gas than would have been the case in an ordinary working year, when the percentage of water gas is maintained to a fairly even line. When comparison is made of the water gas produced with the oil consumption in a few cases picked haphazard from the returns, a great divergence is found in the oil used per 1000 c.ft. In the next section, we have, separately stated, the coal gas and water gas produced, and the total make expressed in cubic feet and, where possible at this inceptive stage, in therms. The sales to prepayment consumers, to ordinary and power consumers, and to public lamps are separately stated, and the total sold is recorded in cubic feet, and where possible in therms. Succeeding, instructive items are the makes of coke and breeze, tar, and sulphate of ammonia; but we wish these had been officially described as "secondary products," and not as "residuals." Their places in the markets and industries of the world are important; and their values are anything but negligible in respect of the price charged for the primary product. In the next section, the numbers of prepayment and ordinary consumers are stated, together with the total; and, finally, the length of mains possessed by each undertaking is given. There is a wealth of information here, in which those will revel who have a *penchant* for the investigation of statistics; but in making such investigation, the abnormal character of the year must always be borne in mind. At the end of the returns are statements as to "other gas" made, gas sold and bought in bulk, and as to materials used other than coal, coke, and gas oil. For instance, a few concerns had experience of carbonizing wood for gas-making during the coal stoppage.

Examining the total figures for Great Britain, it is seen that the quantity of coal carbonized by the statutory undertakings in 1921 (despite the coal stoppage and the deletion of the Irish consumption) was 15,775,696 tons, from which 194,518,147,000 c.ft. of gas were made, or 12,330 c.ft. per ton. The quantity of coke employed in the making of 49,894,716,000 c.ft. of water gas was 1,254,122 tons, and of oil 51,731,492 gallons. Of course, a large quantity of the water gas was of the "blue" variety; so that there is no value whatever in ascertaining that the oil used averaged 1·03 gallon per 1000 c.ft. of water gas made. Including 4,606,869,000 c.ft. of "other gas," the total amount of gas produced in the year was 249,019,732,000 c.ft. Of this total, the water gas made was equal to a shade over 20 p.ct. As to the sale of gas, during the three months' coal stoppage consumers had to exercise great economy. But they did not require much coaxing to do this, owing to the exceptionally high temperature that prevailed throughout the summer. The total sale was 229,077,112,000 c.ft., or a reduction of 6,325,712,000 c.ft. compared with 1920. Of the total, the prepayment consumers took 80,285,658,000 c.ft.; the ordinary and power consumers, &c., 141,768,032,000 c.ft.; and the public lamps, 7,023,422,000 c.ft. But if the consumption in that abnormal year decreased, the number of consumers continued to ascend. The total was 7,559,310, or 110,978 more than in 1920. The prepayment consumers are well ahead of the ordinaries—the figures being respectively 4,071,220, and 3,488,090, although the total consumption of the prepayment consumers is only slightly more than 56 p.ct. of that of the ordinary consumers. The total quantity of coke and breeze made was 10,404,702 tons, or for every ton of coal carbonized 0·66 ton. The tar produced amounted to 160,376,472 gallons, or 10·16 gallons per ton of coal carbonized. The sulphate of ammonia made was 115,979 tons; but as so many undertakings are not manufacturers, to present a calculation based on the total coal carbonized would show a per ton figure (some 16 lbs.) that has not the slightest claim to actuality. The mileage of the industry's mains continues to extend. In 1921, the figure reached 39,547¾ miles, which was an ascent from 38,847 miles at the end of 1920.

The new form of returns, so far as the manufacturing and supply data are concerned, is full of interest; and when conditions will allow of complete figures being given in respect of average calorific power according to official tests, as well as the therms made and sold, the statistics will be still more valuable. Those readers who wish to keep complete sets of the returns from the therm epoch, had better not defer too long becoming possessed of a copy of this first issue.

Progress to Normal Conditions.

THE report and accounts which the Governor of the Gas Light and Coke Company (Mr. D. Milne Watson) will submit to the proprietors on Friday show how considerable was the movement during the year 1922 towards more normal conditions in respect of the production and supply of gas. Nevertheless, no one at the moment will hazard any prediction as to what will in future be regarded as fairly normal conditions for a gas undertaking in respect of costs or gas charges, as it is perfectly obvious that the out-goings in conducting the gas business are not likely to reach the standards of (say) 1913 for very long to come. But there will be on Friday congratulations to the proprietors, and from the proprietors to the Board, over the financial strengthening that 1922 has given to this enormous undertaking after the highly difficult year that preceded it. The chief causes of the better financial state are the decline in the costs of manufacture, and the increase of the gas business, though, through price reductions, there was a considerable drop in the revenue from gas—despite the additional consumption. A set-off against the healthy-looking gross reduced cost of manufacturing materials was the natural fall in the values of coke and breeze.

Looking first at the manufacturing charges, the total expenditure under this head was £5,903,075, which is less than in 1921 by £1,660,579. On coal (which cost £3,150,328), there was a reduction of £1,070,424, although, in carbonizing 1,897,635 tons, there was an increased use of 60,700 tons. But this large gross saving on coal suffered a considerable change by the lower values of coke and breeze. In producing £1,886,635, the secondary products contributed £622,504 less to the revenue; so that the net cost of coal last year was £1,263,693, as compared with £1,711,613 in 1921. Therefore, the net cost of coal last year was £447,920 less than in the preceding year. There was a reduced consumption of oil; and prices were more favourable. The amount used was 11,613,240 gallons, being a reduction of 2,519,539 gallons compared with the previous year. The cost was £204,161, or £317,211 less. The charge for coke —£333,515—was also lower by £151,041. Salaries were reduced by £1267, wages by £151,994, and purification costs by £18,134. The only charge under manufacture which showed an increase was repair and maintenance of works and plant, which, in the total of £1,690,512, contains an addition of £49,489. Reference has been made to the reduced contribution of the secondary products, to the amount of £622,504; and therefore it will be convenient to mention here that the yield of coke was £1,377,361, or a reduction of £575,978. Breeze produced £105,201, or a diminution of £94,708. Tar and tar products subscribed an additional £48,603, by producing £273,633; while ammoniacal liquor and sulphate of ammonia contributed £130,438, or a reduction of £423.

In both the manufacturing and selling departments, the operations of the Company have been very successful. The production was 174,324,718 therms at actual calorific value, or 11,904,417 therms more than in 1921. In cubic feet the production was 35,487,465,000, or 1,753,178,000 more than in 1921. Of the total, 24,491,155,000 c.ft. were coal gas, and 10,996,310,000 c.ft. water gas—the make of coal gas being 12,906 c.ft. per ton of coal carbonized. In considering the increase in the sales of gas, it must be remembered that the Ilford Gas Company's undertaking was transferred in July last year. In the comparisons, however, this has been taken into account; so that, when we speak of the income for gas having been for last year (at the lower charges) £7,488,848, and that this shows a reduction of £627,898, this applies comparatively to the whole business. The total sale of gas in the twelvemonth was (at actual calorific value) 158,755,869 therms, which is equal to 157,721,353 therms on the declared value of 475 B.Th.U. up to June 14 and 500 B.Th.U. since. The increase in sales on the actual value was 11,205,935 therms. In cubic feet, the consumption was 32,313,544,000, or an increase of 1,668,073,000. This growth is partly due to the additional consumers, and partly to the atmospheric conditions being more favourable to the consumption of gas. The expansion of custom is notable, and affords good ground for congratulation. The

increase in the number of consumers is 29,206; but this includes 16,766 taken over from the Ilford Company. The number of stoves sold and let on hire has been augmented by no fewer than 78,943; and this only includes 14,000 taken over from the Ilford Company. It is a gratifying showing, and is good evidence of popularity, despite the efforts to disparage gas. There are figures in the accounts which bear upon this. In the statement of capital, it is seen that on new and additional mains and service-pipes £54,820 has been spent; on new and additional meters, £84,549; and on new and additional stoves, £186,732. In the revenue account, too, the rental of meters, stoves, and fittings together exhibit an advance of £37,535. The £180,071 produced as meter-rental was more by £12,022; the £219,425 yielded as stove-rental was £23,411 more; and the £308,471 brought in as fittings rental represented an increase of £2102. This is all very gratifying, and supplies good assurance for the future.

To sum-up, the total income was £10,110,354, or a reduction of £1,216,009. We have not dealt with all the items of expenditure; but the total was £8,590,169, or a reduction of £1,623,169. The balance to net revenue account, being £1,520,185, shows an increase of £407,160. It will be seen from the report (printed on a subsequent page) that the reserve and redemption funds have been properly cared for; and the ordinary proprietors are receiving a dividend for the second half of the year at the rate of £5 4s. p.ct. per annum, which was the rate also paid in respect of the June half. The consumers during the year enjoyed a reduction from 1s. 2d. per therm to 10d. Thus they as well as the proprietors are sharing in the enhanced prosperity. Only 1d. per therm reduction on the private consumption, we calculate would mean about £640,000 per annum. The consumers take the lion's share of the prosperity that is being gradually recovered.

Modern Developments and Distribution Costs.

ALL whose work compasses the distribution or the sale of gas, or both branches, will find in the paper which Mr. P. E. Browne, the Distributing Engineer of the Brighton and Hove General Gas Company, read last Friday before the London and Southern District Junior Gas Association, many matters that will interest them. The contribution was entitled from "Gasholder to Householder;" and it is another excellent illustration of how, though general principles may apply to almost every gas undertaking, the problems which have to be met are often very dissimilar through the differences of the area in respect of configuration, the relation of industrial to domestic consumption, social conditions, &c. The "industry" of Brighton is largely catering for those seeking delectation, health, rest, and reinvigoration; and therefore, so far as the gas business is concerned, it may practically all be classified as domestic. So regarding it, 96 p.ct. of the output of 2000 million c.ft., or 10 million therms, is domestic, and the small balance industrial. That is not a common condition for undertakings having such a substantial output. However, when one considers the diversity of distribution problems in these times, of critical periods in demand, and of the relation of storage to maximum output, as well as the diversity of the applications of gas, and each application possessing a variety of quantitative requirement, one can well see that the manufacture of gas cannot in the total operations of a gas undertaking claim a superior place to that of distribution and utilization. Manufacture is dependent upon the district work and business; and the district work and business are similarly dependent upon manufacture. When all these considerations are taken into account, the tendency to a devolution of responsibility (which has for some years been the practice of the larger undertakings) is seen to be correct. It is a tendency that will grow, and will penetrate deeper and deeper into the under strata composed of the medium-sized concerns. Such a devolution of responsibility in respect of distribution and sales must, and will, pay for itself, provided men properly trained technically and commercially, men of quick perception, and men who can meet competition fairly and squarely, are appointed for the work. Important, however, as the selling side is, here we will confine ourselves to two or three distribution problems which have arisen from modern developments, and to which Mr. Browne directs attention, and that suggestively.

These problems are highly important to the gas industry; and they require careful handling. It is at the extremes of districts, where the diameter of mains diminishes, that one frequently finds housing developments taking place, through municipal schemes and private enterprise; and allied with this condition is the current fashion of erecting fewer houses upon an acre of ground, and setting them well back from the roadway. From the health point of view this is probably good, but it is a disadvantage from the standpoint of the gas undertaking. There, among others, we have two new distribution problems; and Mr. Browne in his paper tells us how they have been dealt with at Brighton. The first problem is one of supply; the second, one of finance. Naturally, the solution of the former that at once comes to mind is boosting. There is the western district of the Company's area; and with a booster of 65,000 c.ft. capacity, there has been entirely satisfactory experience in dealing with the increased but vagarious demand there. However, the development of Bungalow Town, and the influx of visitors there at the week-end, have necessitated increased boosting provision; and so a booster of 250,000 c.ft. capacity is replacing the old one. The arterial mains to the area being amply proportioned, there is confidence that the larger machine will eradicate any difficulty. But a more interesting problem is found in the northern limits of Brighton and Hove; and it is being dealt with by the laying of a special feeder main carrying high-pressure gas, from which main connections will be taken into the district trunk mains at the main arteries from the town, at points approximately a mile from the centre of the town, with suitable governing to throw adequate pressure at these points. Electric driven compressors of the rotary drum type are being employed. The new main, which is being laid round the district for a distance of about 6¼ miles—from the Hove holder station to the Black Rock station—is 12-in. in diameter.

This raises the interesting question as to whether it is better to incur a greater expenditure on a main, and so reduce the cost of compression, or to incur a higher cost of compression by laying a smaller diameter main. The former course has been adopted, and for these reasons: A pre-determined delivery under high pressure may be obtained with a comparatively low initial pressure and large diameter main; whereas if a small main is laid, a disproportionately high initial pressure—involving the employment of a much greater horse power per unit volume, and a consequent higher cost per 1000 c.ft. for compression—is needed. The initial required delivery in this case has been gauged at 75,000 c.ft. per hour; and there is in the paper a table which shows a tremendous divergence for this initial delivery between the horse powers required per 1000 c.ft. for compression with different sized mains, as well as between the initial pressures per sq. in. The horse power needed per 1000 c.ft. with the 12-in. main is only 0·25, and the initial pressure is 1 lb. per sq. in. But with a 4-in. main, the figures are 2·72 H.P. and 75 lbs. per sq. in.; on a 6-in. main, 1·57 H.P. and 20 lbs. per sq. in.; and on an 8-in. main, 0·55 H.P. and 5 lbs. per sq. in. We think in the circumstances a wise decision was come to in adopting the 12-in. main; and certainly in it and the present low initial pressure, there is a large potential reserve for the future. It is good policy to look forward, especially having in view the increasing costs of main enlargement in comparison with past times.

This brings us to another problem; and a difficult one too. Modern developments in fast-moving vehicular traffic have brought changes in the construction of roadways. Paved surfaces with concrete foundations, now frequently strengthened by expanded metal, have added to the burdens of gas undertakings—burdens financial and otherwise. Should there be from any cause an escape of gas under such roadways, it is more difficult to locate it than was the case in the days before these changes came about. Subsidences may occur under the concrete foundations, and mains may be injured. But who is to know of this in such circumstances? The place at which the gas will find outlet may be quite a long way from the seat of the escape. To open-up roads with concrete, or reinforced concrete, foundations is a tedious and costly job; to reinstate them is also very expensive. The result of these changes is that the cost of the distribution of such a public necessity as gas has become enhanced. In Mr. Browne's opinion, it is not justice to throw the onus of this upon gas and other public utility companies, nor yet the cost of overhauling and putting into repair mains and services in roadways about to be reconstructed. He makes a suggestion. In his view, the cost ought to be shared by the Ministry of Transport, who, it is understood, were to apply the taxes obtained

from commercial and private motor users to new road construction; and this, Mr. Browne considers, should include the reconditioning of underlying gas mains and service-pipes. This will no doubt be heartily endorsed by gas suppliers; the difficulty would be to make the Ministry of Transport see the matter in the same light, even though urged on the ground of equity. Nevertheless, there would be no harm in appealing to the proper authorities for assistance—not assistance for the gas suppliers, but for the gas consumers, who, in existing circumstances, have to bear the expenses incurred through conditions brought about by these modern changes.

The further modern change which adds to the costs of distribution is the opening-up of new estates on the plan of giving more breathing space by having fewer houses constructed per acre, and the houses set well back from the roadways. In such circumstances, Mr. Browne fears that the profit on the sale of gas will be swallowed-up by the interest alone on the capital expenditure. At the same time, gas undertakings cannot afford not to be in evidence wherever new building is going on; and so in those circumstances they must make the best possible bargain within their statutory powers. The practice at Brighton is to require the estate or house owner (as the case may be) to reimburse a portion of the outlay on the new main or extension, by way of a yearly rental for a term of years; the payment being computed by the Company to provide 8 p.ct. per annum to allow for interest on the capital and for maintenance. In the case of new services, payment is required for that portion beyond the statutory 30 ft. laid free on the public highway, and the whole of the distance inside the boundary of the property. Mr. Browne does not know if this is the practice of other gas undertakings; but he believes it is the only sound policy. If it is the only sound policy, it is the only reasonable one. We suggest for consideration that, this being a development of modern times, there might be an amendment of legislative powers in this connection, though we confess it would mean a complication. One method would be that, in such cases, so far as the service-pipes are concerned, the gas suppliers might be allowed to charge an additional price for gas with a sliding-scale according to the distance the service has had to be laid. There is precedent for this in the extra charge for prepayment meters and fittings.

Gas suppliers cannot rule modern developments so that they will conform to their best interests. They have to face them. But change should beget change; and there should be an appeal to Parliament to place gas undertakings in a position, if a way can be discovered, to meet these changes without inflicting pecuniary damage upon the consumers and share or stock holders. There we must leave these subjects; and without following Mr. Browne into the part of his paper dealing with the selling end of the operations of a gas undertaking as illustrated by Brighton, we will conclude by giving the emphasis of repetition to one of his remarks: "The most profitable business to-day undoubtedly lies in the development of existing services."

Ignorance in the Newspapers.

We have had a remarkable display lately of the nescience of certain daily papers regarding gas matters. The tendency of the editors seems to be to lay hold of anything that will give a lead—no matter how foolish—to the saying of something derogatory to the gas industry, and to the traducing of its primary product. The "Glasgow Herald" on Tuesday of last week had a short editorial article under the heading of "Is Gas Obsolete?" and the writer left no room for doubt in the minds of his readers that he thinks it is. Equally by what he said he convinced those who are well-informed on gas affairs that either his knowledge of them is in the region of *nil*, or that he has had a Rip van Winkle sleep, and so has not heard of the advances in the applications of gas. We suggest that he should obtain enlightenment by a visit to the showrooms of the Gas Department. The methods of utilizing gas have not stood still. Science has been busy improving its applications. Thus the means by which it is applied are entirely modern, and not antiquated, and the purposes to which it is applied have been growing in number, and each in extent, in a truly remarkable manner. And why is this? The "Glasgow Herald" obviously could not reply; and so we will give it the information: Because it is the most economical of Nature's provisions for securing heat by labour-saving and non-smoke and non-dust yielding methods, and the heat can be regulated to will and purpose to a nicety. The "Glasgow Herald" writer knows nothing of these matters; and so his education is defective. He was induced to make an unconscious revelation of this by the absurd notice of motion for a recent meeting of the London County Council, which suggested that, in view of certain experimental ventures of three or four Metropolitan Borough Councils in the use of electricity for cooking and heating, gas is no longer necessary in the running of our homes. Upon this point, our Scottish contemporary thinks that people who have had experience of both gas and electricity would not have much difficulty in coming to a decision; and so several puerile things are said that are intended to be derogatory to gas, but which prove a want of even elementary knowledge. It is remarked: "When one "thinks of it, it is difficult to get up any enthusiasm at this "time of day for a system which consists in conveying a "poisonous, malodorous, high explosive, and also highly "expensive vapour through pipes into private dwellings." And again: "Like the steam locomotive and the 'four-"wheeler,' gas is a relic of the early and grimier days of "the Industrial Era."

Let us examine these points. First, as to people who have had experience of both gas and electricity frankly admitting that gas is out of date for lighting, cooking, and heating. At the meeting of the Institution of Gas Engineers last June, Dr. Carpenter, the President of the South Metropolitan Gas Company, stated that one of his pleasures is to have placed before him regularly a list of people who within the previous week or two have had electric lighting taken out of their houses, &c., and incandescent gas lighting installed. This may sound strange to the man with such limited knowledge of these matters as the writer in the "Glasgow Herald." But there is the fact. Various reasons exist for the preference. Reliability is one; quality of light another; and many people find incandescent gas lighting more economical than electric lighting. The progress of adoption of gas-fires by householders goes on unabated; and why? Because the heat transmitted to a room is much greater for a given sum of money than can be obtained from any electric radiator. Therefore, for equivalent heat transmission from the two sources, there has to be far less expenditure for gas than for electricity. Nearly all gas undertakings have displaced electric radiators by gas-fires solely on account of cost in relation to effective service, which is the important matter. The same thing has been happening to electric cooking. The writer in question has not heard of the joyful return to gas by people disappointed with electrical performance and prodigal costs. Nor apparently has he heard of the fact that several of the tenants in Glasgow Corporation houses are dissatisfied with the electric-cookers that were installed, and in substitution have asked for the well-tried and trusty gas-cookers. Reliability and economy are at the base of these preferences for the modern—not the antiquated—methods of gas application. The writer of the foolishness in the "Glasgow Herald" should make a study of the efficiencies of electricity generation; and then he will probably know why it is that the potential heat energy delivered to users of electricity is so much more expensive than in the case of the potential heat energy delivered in the case of gas. The cause of the relatively small use of electricity for heating and cooking is not, as the writer supposes, merely due to the heavy initial outlay involved in the introduction of electric wiring and apparatus. It goes deeper than that. But he thinks that, if it were not for this heavy initial expense, there is not a householder who would not instantly exchange gas-lights and gas-fires for the electrical types. There he is mistaken. But supposing they did. Coal would still have to be carbonized for the maintenance of the chemical, dye, and other industries dependent on the secondary products, and to meet the demand for explosives in the time of war. What would the writer in the "Glasgow Herald" do with the gas produced? Would he help the national economy by dissipating it into the atmosphere? Or would he utilize it for the generation of electricity, by expending (say) 30,000 of its B.Th.U. for the generation of a unit of electricity with a potential value of 3420 B.Th.U.? If he thinks over it, perhaps he would prefer to use the gas direct, and so obtain the maximum heating value.

The absurdity contained in the article (which is not what we usually look for in the "Glasgow Herald") is capped by the description of the gas system as one which consists in conveying a poisonous, malodorous, highly explosive, and also highly expensive vapour through pipes into dwelling-

houses. An atmosphere of any gas could extinguish human life. We do not know what is meant by "malodorous" when applied to gas, properly used. The writer in the "Glasgow Herald" should put his head up a chimney, and inhale the products of combustion from a coal fire. He would then get (if he survived) a proper knowledge of what he attempted to write about. As to gas being highly explosive, it is nothing of the kind until mixed with the necessary proportion of air. The fact that a gas and air mixture in right proportions is highly explosive constitutes a recommendation in regard to the generation of heat by its complete combustion. Regarding the point as to gas being highly expensive, does the writer mean "highly expensive" in relation to the thermal units supplied for a given sum as compared with electricity, which he so strongly recommends? If so, then the writer is either very innocent or grossly ignorant. We should be very pleased to hear from him on all these points. Modern gas methods have to do neither with the age of George IV., nor with the Minoan Palace at Knossos, nor with the tomb of Tutankhamen. The references to these are quite in keeping with the rest of the article in our Scottish morning contemporary.

A National Gas Exhibition.

The Chairman of the Midland Circle of Gas Salesmen announced at their first meeting that, coincident with the annual meeting of the "B.C.G.A." in Birmingham, it is proposed to hold a national gas exhibition. For the purpose, an Executive Committee has been appointed, and various Technical Sub-Committees are being formed. It is hoped to have co-operative displays by the local gas undertakings, working demonstrations of the uses of gas for various purposes, manufacturers' exhibits, competitions, lectures, &c. This event will have the backing of the central institutions; and so it is anticipated that the result will be highly successful.

Geyser Fixing.

There have been a couple of fatalities lately through unventilated geysers; and some correspondence has appeared in "The Ironmonger" on the subject. No geyser should be fixed and left for use by people with whom familiarity breeds contempt, without having a ventilating flue entirely beyond their control. Yet with all the warnings there have been, there are plumbers and gas-fitters doing business outside the gas industry who appear to be absolutely callous regarding the provision that is necessary to render safety a certainty. In one of the cases referred to by "The Ironmonger," the regulations issued by the makers were totally ignored in fixing the geyser. A letter on the subject to our contemporary (written by Mr. W. J. Smith, Secretary to the National Gas Council) states that the Gas Appliances Specification Committee have been for some time devoting their attention to the preparation of a specification for the construction of geysers; and one of the points which is receiving their careful attention is the manner in which geysers should be fitted in order to render them as "fool-proof" as possible. There is no assurance in this. The instructions of the manufacturers are ignored by fitters who are not working for gas suppliers. It comes to this—that gas undertakings should have compulsory powers of prescription and supervision in the case of all new internal fitting, or any alterations or additions to the installations.

The CO Campaign.

This has continued during the past week; but there has been somewhat less about which to talk. The motion to which allusion was made a week ago came before the London County Council; but there was no discussion upon it. It was simply referred to the Public Control and the General Purposes Committees to report as to whether legislative or other steps should be taken to secure that gas suppliers should not distribute gas which can be so used as to produce illness or death, and, in fact, whether the time has not arrived—in view of what it is believed electricity can do in respect of heating and cooking—when gas can be done away with altogether. Of course, what, if anything, is wanted is legislation (if it could be made effective) to prevent people misusing gas, and putting it to purposes for which it was never intended. Because they will do these things, there are a few peculiar people who think a valuable public utility should be dispensed with. Because there are accidents on railway lines and people use them for leaving this world, no one talks of doing without railways. No one thinks of filling in the River Thames, in view of its misuse by people who are tired of life. No one proposes to stop the running of motor vehicles in the streets of the Metropolis on the ground that the accidents and fatalities through them are numerous. We shall be immensely interested in the report of the County Council Committees on the motion, and especially on the subject of the abolition of gas supply, in view of what electricity is supposed to be capable of doing. The Bethnal Green Borough Council have asked for an inquiry into the question of supplying gas containing carbon monoxide. The Battersea Borough Council have also been considering the subject. They seem to think—or rather the Health Committee do—that carbon monoxide is allowed to be added to coal gas in order to improve its illuminating power! And therefore means should be taken to prevent its escaping into houses. It is thought that, if it is not possible to eliminate the "poisonous element," an obligation should be placed upon gas companies to ensure that the pipes and fittings are in such a condition that no accident can arise. That is rather a steep suggestion—particularly in view of the fact that the pipes and fittings in a large number of cases are not the property of the gas suppliers. If it is practicable to place such a condition upon gas supply, why not upon other public services. Fancy a world in which the conditions are such that "no accident can arise." A curious thing is that people seem to regard carbon monoxide in town gas as something new. One correspondent of the "Evening Standard" refers to it as a "new peril," apparently not knowing there has always been carbon monoxide in town gas. Mr. F. W. Goodenough has informed the readers of our evening contemporary that there is no "new peril"—that there has been no increase in the percentage of carbon monoxide in town gas in the last twenty years, and that no carbon monoxide is distributed alone, but only in admixture with strong-smelling coal gas.

OBITUARY.

The Public Control Committee of the London County Council report with regret the death, on Christmas Eve, of Mr. R. G. GRIMWOOD, who was one of their Gas Examiners.

ELECTRICITY SUPPLY MEMORANDA.

THE electricity industry as well as the gas industry has had its newspaper "stunt." The two "stunts" were similar in one respect—that deception was at the bottom of both. The electrical newspaper stunt was over the concentration of electricity generation and the erection of super-power stations, which were by some magic to give heat at a cheaper rate than coal, and so save the community fabulous millions of tons per annum of that material. From the super-stations was to flow (as Mr. Churchill picturesquely put it) electrical "juice" to every cottage in the land, at a price which would enable the tenants to use the current for lighting, heating, and cooking. The iridescent bubble has been pricked; but the daily papers continue to harp on this piece of romance as though it is something about to materialize. It is, however, bad business when an electrical technical paper writes in a strain which indicates that the fable has also been largely accepted by it. The "Electrical Review" has been taken to task by Mr. F. W. Purse, of West Ham, over a leaderette which it published regarding the reorganization of electricity supply in London, and in which it was suggested that by the reorganization there would be a considerable reduction in "the variety of methods, systems, and prices" which now obtain. Mr. Purse says he has yet to learn in what way the reorganization of electricity supply is going to make any appreciable difference in these respects—particularly in prices. He points out certain of the technical obstacles that exist in London to the realization of such perfection that the retail prices to consumers could be identical in every respect. Concluding his letter, Mr. Purse says: "It is rather unfortunate that the Technical Press should assist the lay Press by repeating such statements, which, while representing the state of affairs as now existing, lead one to believe that a radical change is coming when such is not the case. The best fate for the capital station bogey is capital punishment—it would be a capital ending to a stunt which can only benefit the capitalist in the capital of England."

The Issues of Reorganization.

A Vague Basis of Hope.

So it was merely a "stunt," which can only be to the benefit of the capitalist. It was on this "stunt" that the late (in this matter) unsophisticated Government framed and carried legislation to reorganize and extend the elec-

tricity generation and transmission plant of the country, and the central feature of the whole scheme was to be the super-power stations. It has been proved over and over again that there is a limit to the size of a unit of generating plant at which further economy can be realized; and this limit has been reached in many of the existing stations. At the best, a super-power station can only be a collection of such units; and any additional generating economy that may be secured will be off-set by the high cost of transmission through extensive lines of expensive cables. However, the "Electrical Review" cannot conceive of any sort of reorganization which would leave "the variety of methods, systems, and prices" untouched. True. The "prices" may be touched, but not necessarily for the better. Who can tell? Everything about all this business is as yet very vague. Nevertheless, the "Review" is "sanguine enough to believe that a cheap and abundant supply of electricity is really possible, and not so remote as Mr. Purse would have us believe." The reduction of prices that are currently being effected are through the existing stations, and not super ones, which the "Review" considers are very properly described by Mr. Purse as a "bogey." That is a view on which there can be agreement with our contemporary. We are also perfectly in accord with the latter part of another statement: "Electricity, in many areas, has forced its way to the front by sheer merit, and in spite of high prices; but there is a limit to its growth under such circumstances."

Capacity and Charges.

In the "Memoranda" for Dec. 13 and 20, there were references to a paper by Mr. W. A. Gillott on "Domestic Load Building." A report of a discussion on the subject at the North-Western Centre of the Institution of Electrical Engineers has appeared in the "Electrical Review." On the occasion, there was some very plain speaking. Warning was given by Mr. H. Dickinson, of Liverpool, regarding a supply difficulty if there is a large development in the domestic load. In the case of direct-current supply over long distances from substations, in his opinion there is bound to be trouble in maintaining the pressure at the ends of the distributors. Therefore, he can see no use in going in for a big campaign to develop the use of domestic appliances until there is some method of dealing with the load. On an alternating current system, it is comparatively easy to construct additional sub-stations; but when a new direct-current sub-station has to be installed, it is a very costly matter. The question of tariffs received a considerable amount of attention during the discussion; and the divergent opinions indicate that electrical men have not yet, after struggling with the problem for years, found a basis of charge which will meet all their views. Mr. Dickinson is favourable to a two-part tariff—a fixed rate and a low running charge; but he has failed to discover a safe, or approximately safe, basis for the former. The ratable value plan is not, to his mind, by any means ideal. It has the disadvantage that, in the better areas of a town, the fixed charge bears a higher proportion of the total cost than is the case in the poorer districts. Again, if the tariff is fixed on the kilowatt basis, it means that the number of lights in a house must be checked every year. In the judgment of Mr. J. E. Nelson, a low flat rate is more likely to attract domestic consumers than a more favourable two-part tariff, which is difficult to explain to the housewife. But low flat rates are scarce for cooking and heating. Looking at the rates charged for these purposes by ten undertakings in south-west Lancashire and Cheshire, he finds that the lowest is 1½d. per unit; the highest, 4·4d.; and the majority are not less than 2d. Some electrical men have said that much business can be obtained at 1½d. and 2d.; but Mr. Nelson asserts that at these rates heating and cooking by electricity are a luxury. Another speaker—Mr. H. P. Tavernor—explained that in his district, where the average house has only from ten to twelve lights, it would not be advisable to have a two-part tariff; so that the system is not generally applicable.

Some Comparisons.

The point as to 1½d. and 2d. causing heating and cooking by electricity to be a luxury, was emphasized by some figures given by Mr. O. C. Waygood. He mentioned that a drawing-room coal fire would consume 1 cwt. of coal in sixty hours, which, with coal at 45s. per ton, would cost approximately 0·5d. per hour. To make a 2-KW. electric fire equal to that in cost of running, energy would have to be supplied at 0·25d. per KW.-hour. In addition, maintenance charges due to the elements fusing would have to be met. In regard to cooking, he gave the following relative figures as to the prices of electric and gas cookers, and cost of hire:

Cooker.	List Price.	Cost of Hire per Annum.
Electric	£22 ..	20 p.ct. = £4 8s.
Gas	£10 ..	3 p.ct. = 6s.

From this comparison, it was estimated that with electrical energy at 0·5 per KW.-hour and gas at 30d. per 1000 c.ft., cooking with electricity becomes a financial proposition. It depends upon what worth is comprised in the term "cooking." As to the present tendency to charge 1½d. per KW.-hour, experience, Mr. Waygood says, suggests that the inclusive figure is much higher. These facts must, he declares, be faced, and dealt with, in any propaganda.

Propaganda and Heating and Cooking.

There was some criticism of the lines of current electrical propaganda. Electric cooking seems to be the great thing now. There is no doubt Mr. Nelson is right when he says that the best propagandist is satisfactory service, which cannot be given without reliable appliances. His idea is that electric heating, while equally as profitable to the supplier as electric cooking, is more easily introduced in the home by reason of the relatively cheap apparatus obtainable, and its more "obvious advantages." He is very emphatic as to this; for we find him adding that, "from the point of view of propaganda work, heating is a safer recommendation than cooking to the domestic electricity user." Of course, there will be large dissent from this in the industry, inasmuch as cooking is an all-the-year-round business, while heating is a seasonal matter, and at other times the capital employed in satisfying the heating demand must be lying idle. Among other criticisms by Mr. Nelson was the one that the mechanical details in small electric appliances are frequently faulty, especially at the terminals. In the view of Mr. Tavernor, too, an electric fire, kettle, and boiling-ring are far better than a cooker in the case of smaller houses—the ten to twelve light ones. That the cost of selling appliances at the present time and the high cost of extra wiring are distinct hindrances to domestic electrification progress are among other questions touched upon.

Water Boiling Efficiencies.

In the course of the discussion, two or three interesting figures were given, from laboratory tests made at the University of Liverpool, regarding the efficiency of apparatus used for raising water to the boiling-point. These show that the efficiency of the immersion type heater, under ideal conditions, is 90 p.ct.; that of the well-known immersion type element heater averages about 80 p.ct. under normal conditions; and the maximum efficiency of the standard flat-ring boiler (about 0·75 KW. capacity to boil 1·6 pints) is 38 p.ct. These figures were supplied by Mr. Waygood, who says they indicate that, in order that customers may get the best results, the immersion type is the one the manufacturers should standardize for kettles.

Salesmen and Satisfaction.

As mentioned by one of the speakers in the discussion referred to in the previous paragraphs, the best propagandist is satisfaction. A satisfied consumer will do a considerable amount of good in speaking of his experiences; a dissatisfied one will inflict infinite harm by doing the same thing. There seems to be much need not only of technical education among electrical salesmen, but of forcing home conviction among them that it is consummate folly to recommend anything that is undersized or inefficient for the work to be performed in order to secure an appearance of economy. In such circumstances, there must be dissatisfaction. Economy and efficiency in performance must go together, or there will not be contentment. That is why we have little patience with all the humbug about a little electric radiator being sufficient to warm a person without troubling about the room itself. If he does not want to have a cold, the person being heated must have the little radiators on all sides of him. The best plan is to heat a room so that anyone may enjoy the comfort, and in any part. With regard to the size of the radiator, it must have some proper relation to the size of the room; otherwise, the result will be disastrous. So with lighting. We have seen rooms in which the electric lamps installed are absurdly inadequate; we have seen shop windows in which they are absurdly beyond requirement, and with the glaring filaments exposed to all who desire to do what the dazzling lights prevent their doing. If it is not technical education that is required among electrical salesmen, then these conditions that are found so frequently show a lamentable deficiency of honesty towards consumers, and a remarkable disregard of the permanent interests of the undertakings they are supposed to serve. Business-getting should be governed by a desire to have business maintenance.

Turbine Accidents.

There have lately been a number of interruptions of electricity supply; and there have been a couple of noticeable accidents to turbines. Only the other day we were referring to the accident to a turbo-alternator at the works of the General Electric Company at Witton. Some papers said it burst; others that there was an explosion. Anyway, pieces of machinery flew in all directions, and considerable damage was done, including personal injuries. Last Friday week the St. Pancras generating station was the scene of something similar. There was a tremendous concussion. One of the high-speed revolving parts of the largest and latest type of turbine in use at the station became detached, causing damage estimated at thousands of pounds. The machine had only been installed a few weeks. Mechanism flew all over the place, which was also filled with steam. Fortunately no personal injury was sustained. But for a time, until there could be adjustment to circumstances, the lighting and power users were deprived of current.

The late Mr. Alfred Kitt left estate of the gross value of £20,819.

BOARD OF TRADE GAS UNDERTAKINGS RETURN.

Manufacture and Supply of Gas.

THERE is a great change, both in the form in which they are prepared and in the time of publication, in the latest issue of the Board of Trade return relating to all authorized gas undertakings in Great Britain, covering the year 1921. As before, the return is divided into two parts; but instead of the division being between those belonging to companies and those in the hands of local authorities, Part I. is now to contain particulars relating to the manufacture and supply of gas by both classes of undertakings, and Part II. is to relate to the finance of the undertakings, and show the prices charged for gas. The information now given for all undertakings relates to the calendar year, with a few exceptions which are set out in the return.

Part I., dealing with the manufacture and supply of gas in respect of the year 1921 by gas undertakings in Great Britain (the Board of Trade having ceased to exercise jurisdiction with regard to Irish concerns), was published last week by H.M. Stationery Office, Imperial House, Kingsway, London, W.C., and branches, at the price of 5s. net, post free 5s. 1½d.

Owing to absorption, various undertakings cease to appear on the present occasion; but, on the other hand, there are seven new-comers: Masham Urban District Council, Montgomery Corporation, Thurstonland Urban District Council, Buckhaven, Methil, and Innerleven Corporation, and Lanarkshire County Council (three). This time, too, all the undertakings in England and Wales, and then those in Scotland, are given in alphabetical order, instead of, as hitherto, being placed under the names of the counties in which they are situated.

In view of the passing of the Gas Regulation Act, the return omits reference to previously existing illuminating power and calorific standards, but includes particulars of calorific value declared and average calorific value supplied, as officially ascertained. Declarations of calorific value were made by 184 undertakings on or before Dec. 31, 1921. This, as a matter of fact, is the first column of the return. The next column shows, as before, the maximum and average figures in respect of the proportion of water gas supplied.

Both figures and names are printed in much larger type; and another improvement is the printing of the table the long way of the page, instead of across two pages. Information as to the quantities of residuals made appears in the return for the first time. Again, much information that the student has hitherto, at great cost in labour, had to pick out for himself from the tables, is now given separately at the end of the return. Separate columns are furnished showing the quantities of coke (for water gas) and of oil used in the manufacture of gas; and particulars of other materials used are given independently. In the case of some undertakings, "other" gas has been made, particulars of which are also given separately. This being the first issue of the return in its new form, it will be of interest to indicate the precise method adopted of setting forth the particulars; and for this purpose the table heading is reproduced.

It will be seen that the quantities of gas made and sold during the year are shown both in cubic feet and therms where the undertaking was authorized over any part of the year to charge for heat units supplied. In the introduction to the return, it is pointed out that, except in the case of the South Metropolitan Gas Company, the particulars given as to the number of therms made and sold in the year are calculated figures, as no other undertaking was authorized to charge for therms throughout the whole year. In ascertaining the number of therms made, the calculation has been based on the average calorific value supplied, where known, and in other cases on the declared calorific value. The number of therms sold is calculated on the basis of declared calorific value.

The comparative table on p. 260 gives the totals of the whole of the authorized undertakings included in the return for the years 1920 and 1921. The separate figures for England and Wales and Scotland for the year 1921 are: England and Wales—Coal carbonized, 14,168,094 tons; coke for water gas, 1,207,004 tons; oil used, 51,573,577 gallons; coal gas made, 175,857,966,000 c.ft.; water gas, 48,130,149,000 c.ft.; total, 228,524,923,000 c.ft.; sold to prepayment consumers, 75,084,478,000 c.ft.; to ordinary and power consumers, &c., 128,853,161,000 c.ft.; for public lamps, 6,203,981,000 c.ft.; total sold, 210,141,620,000 c.ft.; coke and breeze, 9,434,851 tons; tar, 143,130,812 gallons; sulphate of ammonia, 101,738 tons; number of prepayment consumers, 3,790,608; ordinary consumers, 2,999,255; total number of consumers, 6,789,863; length of gas-mains, 36,260¼ miles. Scotland—Coal carbonized, 1,607,602 tons; coke for water gas, 47,118 tons; oil used, 157,915 gallons; coal gas made, 18,660,181,000 c.ft.; water gas, 1,764,567,000 c.ft.; total made, 20,494,809,000 c.ft.; sold to prepayment consumers, 5,201,180,000 c.ft.; to ordinary and power consumers, &c., 12,914,871,000 c.ft.; for public lamps, 819,441,000 c.ft.; total sold, 18,935,492,000 c.ft.; coke and breeze, 969,851 tons; tar, 17,245,660 gallons; sulphate of ammonia, 14,241 tons; number of prepayment consumers, 280,612; ordinary consumers, 488,835; total number of consumers, 769,447; length of gas-mains, 3287¼ miles.

Sales of gas in bulk to other authorized undertakings, and purchases from similar concerns, have a place to themselves; but such gas is shown in the return as made by the selling undertaking, and as sold to consumers by the purchasing one. A further separate section gives information as to gas bought by undertakings from owners of coke-ovens; and this gas, too, is shown in the return as sold to consumers by the purchasing undertaking.

DECLARATIONS OF CALORIFIC VALUE.

As already mentioned, declarations of calorific value were made by 184 undertakings on or before Dec. 31, 1921. The particulars given in the return show that the declarations in B.Th.U. standing at that date were as follows; but, of course, the possibility must be borne in mind of variation having been since made.

Abingdon, 450
Aldershot, 500
Andover, 500
Ashton, 500
Aylesbury, 450
Barnard Castle, 530
Bawtry, 500
Bedford, 450
Berkhampstead, 500
Bishop's Stortford, 500
Blyth, 450
Bournemouth, 450
Brentford, 460
Bridgwater, 450
Bridlington, 500
Brigg, 500
Brighton and Hove, 470
Broadstairs, 450
Brodsworth, 500
Budleigh Salterton, 460
Burgess Hill, 460
Burnham (Essex), 500
Burnham (Somerset), 450
Burnley, 475
Cambridge, 475
Cannock, 450
Canterbury, 460
Cardiff, 470
Cheltenham, 470
Chertsey, 480
Chesham, 480
Chester, 460
Chichester, 450
Cleethorpes, 450
Colchester, 470
Commercial Gas Co., 475
Corbridge, 550
Cradley Heath, 475
Cromer, 450
Croydon, 470
Deal and Walmer, 450
Derby, 480
Dinnington, 450
Dunstable, 450
Dursley, 460
Earby and Thornton, 500
Eastbourne, 475
East Cowes, 450
East Hull, 450
Elland-cum-Greetland, 450
Exeter, 475
Exmouth, 500
Falmouth, 460
Faversham, 450
Felixstowe, 450
Folkestone, 480, 470
Frodsham, 470
Frome, 450
Gas Light and Coke Co., 475
Godalming, 500
Gorleston, 480
Grantham, 400
Grays and Tilbury, 400
Great Grimsby, 450
Great Yarmouth, 480
Guildford, 450
Hampton Court, 450
Harpenden, 450
Harrow, 450
Harwich, 450
Haslemere, 450
Hastings, 460
Hatfield, 480
Hemel Hempstead, 500
Henley-on-Thames, 500
Hessle, 425
Hexham, 450
Highbridge, 450
Hornsey, 470
Houghton-le-Spring, 520
Huntingdon, 480
Ilford, 450
Ilfracombe, 425
Ipswich, 450
Irthlingborough, 460
Kettering, 450
Kidderminster, 450
Kidsgrove, 450
King's Lynn, 475
Kingston-upon-Thames, 470
Lea Bridge, 450
Leatherhead, 500
Leighton Buzzard, 480
Littlehampton, 470
Liverpool, 475
Llanelly, 425
Maidenhead, 450
Maidstone, 490
Malton, 500
Merthyr Tydfil, 430
Midsomer Norton, 500
Newark, 410
Newcastle-upon-Tyne, 475
Newport (Mon.), 425
Normanton, 425
North Middlesex, 450
Norwich (British Gas Light Co.), 480
Oxford, 460
Pembroke, 450
Penistone, 500
Pinner, 500
Plymouth, 425
Portsea Island, 450
Potteries (British Gas Light Co.), 470
Prescot, 420
Preston, 480
Ramsbottom, 450
Reading, 460
Redhill, 450
Richmond, 460
Rickmansworth, 475
Riddings District, 450
Rochester, 475
Romford, 450
Rugby, 480
Runcorn, 480
Rushden and Higham Ferrers, 460
Ryde, 450
St. Albans, 450
Salisbury, 450
Shanklin, 450
Sheffield, 480
Sheringham, 500
Shrewsbury, 450
Slough, 500
Solihull, 475
Southampton, 460
Southgate, 450
South Metropolitan Gas Co., 550
South Normanton, 450
South Shields, 475
South Suburban Gas Co., 460
Spenborough U.D.C.—
Cleckheaton, 430
Gomersal, 550
Heckmondwike, 450
Stamford, 450
Stroud, 470
Sutton, 460
Swansea, 450
Tendring Hundred Water Works Co. (Walton-on-Naze Gas), 470
Thanet, Isle of, Gas Co., 460
Torquay, 480
Tottenham, 450
Tunbridge Wells, 450
Uxbridge, 460
Ventnor, 500
Walker and Wallsend, 500
Waltham and Cheshunt, 450
Walton-on-Thames, 450
Wandsworth, Wimbledon, and Epsom Gas Co., 470
Warwick, 470
Watford, 475
Wellingborough, 460
Wellington (Salop.), 450
Welwyn and Knebworth, 480
Westbury, 500
Westgate, 460
Weston-super-Mare, 450
Whitwell, 500
Whitworth Vale, 475
Willenhall, 540
Winchester, 450
Wisbech, 480
Woking, 450
Wolverhampton, 450

Woolton, 470
Worthing, 470
Wrexham, 450
Yeadon, 475
York, 480
Yorktown, 450
Coatbridge, 450
Musselburgh, 450
Stirling, 475

Other Gas.

There are at the end of the return a series of five small tables setting out facts apart from the statistics given in the main body of figures. The first of these relates to the quantity of "other gas" included in the gas made figures of the return in the case of the 35 undertakings specified. The nature of this is in many instances given as Tully gas; in others mixed coal and water gas, semi-water gas, carburetted hydrogen, methane, and blue producer gas. The Glastonbury Corporation made 1,000,000 c.ft. of gas from peat and sawdust, the Hightown Gas and Electricity Company 1,009,000 c.ft. of petrol air gas, the Montgomery Corporation 750,000 c.ft. of petrol air gas, the South Staffordshire Mond Gas (Power and Heating) Company 2,837,356,000 c.ft. of Mond gas, and the Portsov Corporation 61,000 c.ft. of acetylene gas.

Gas in Bulk.

In the next table are the quantities of gas sold in bulk to, or bought in bulk from, other authorized undertakings, which figures are included only once in the body of the return—*i.e.*, as made by the selling undertaking and sold to consumers by the purchasing undertakings. The total thus purchased was 380,256,000 c.ft. There were 29 undertakings which sold gas in bulk to others, and 31 who similarly purchased it. The largest sellers were Hull (British Gas Light Company, Ltd.) 69,172,000 c.ft., and Watford Gas and Coke Company 69,968,000 c.ft.; the largest purchasers being the Kingston-upon-Hull Corporation 69,172,000 c.ft., the Rickmansworth Urban District Council 43,043,000 c.ft., and the Uxbridge, Wycombe, and District Gas Company 67,793,000 c.ft.

Coke-Oven Gas Supplies.

The following quantities of gas (given in the third table) were bought from owners of coke-ovens by authorized gas undertakings, and appear in the return as sold to consumers by those undertakings: Chesterfield Corporation, 9,345,000 c.ft.; Clay Cross Gas Company, 220,000 c.ft.; Dinnington and District Gas Company, 2,491,000 c.ft.; Leeds Corporation, 97,869,000 c.ft.; Little Hulton Urban District Council, 3,859,000 c.ft.; Middlesbrough Corporation, 392,830,000 c.ft.; Ossett Corporation, 29,716,000 c.ft.; Port Talbot Corporation (Margam undertaking), 17,282,000 c.ft.; Rhymney and Aber Valleys Gas and Water Company, 242,421,000 c.ft.; Rotherham Corporation, 67,404,000 c.ft.; Sheffield Gas Company, 328,072,000 c.ft.; Stocksbridge Gas Company, 30,049,000 c.ft.; Swinton and Mexborough Gas Board, 41,744,000 c.ft.; and Wath, Bolton, and Thurnscoe Gas Board, 61,725,000 c.ft. The total quantity of coke-oven gas purchased in this way was 1,325,027,000 c.ft.

Materials Other Than Coal, Coke, and Oil.

In the returns made by some undertakings, information was given as to materials other than coal, coke, and oil used in the manufacture of gas. The particulars so furnished are given in the fourth table. In most cases, the quantities are small. Among the larger amounts, the Birmingham Corporation used 523 tons of wood; the Brighton and Hove General Gas Company, 4981 gallons of benzole; the Budleigh Salterton Gas Company, 5625 gallons of tar; the Grantham Gas Company, 4644 gallons of gazine; the Gravesend and Milton Gas Company, 3654 gallons of carburine enriching spirit; the Hightown Gas and Electricity Company, 1586 gallons of hydrocarbon residue; the Kingston-upon-Thames Gas Company, 3986 gallons of carburine; the Leeds Corporation, 166 tons of anthracite (for water gas); and the Swansea Gas Company, 739 tons of anthracite.

Finally undertakings are enumerated for which the returns relate to a period other than the year ended Dec. 31, 1921.

RETURN RELATING TO ALL AUTHORIZED GAS UNDERTAKINGS IN GREAT BRITAIN FOR THE YEAR 1921.

Part I.—Particulars Relating to the Manufacture and Supply of Gas.

Name of Undertaking.	Calorific Value: (*a*) Declared; (*b*) Average supplied (as officially ascertained).	Proportion of Water Gas supplied in Gas: (*a*) Maximum; (*b*) Average.	Materials used in Manufacture of Gas.			Quantity of Gas.									Quantity of Residuals Made.			Number of Consumers.			Length of Gas Mains.
						Made.				Sold.											
			Coal Carbonized.	Coke for Water Gas.	Oil.	Coal Gas.	Water Gas.	Total Made.		To Prepayment Consumers.	To Ordinary and Power Consumers, &c.	For Public Lamps.	Total Sold.		Coke and Breeze.	Tar.	Sulphate of Ammonia.	Prepayment.	Ordinary.	Total.	
	B.Th.U.	Per Cent.	Tons.	Tons.	Gallons.	1000 C.Ft.	1000 C.Ft.	1000 C.Ft.	Therms.	1000 C.Ft.	1000 C.Ft.	1000 C.Ft.	1000 C.Ft.	Therms.	Tons.	Gallons.	Tons.				Miles.

COMPARATIVE TABLE.

Year.	Number of Authorized Undertakings Included in Return.	Materials Used in Manufacture of Gas.			Quantity of Gas.									Quantity of Residuals Made.			Number of Consumers.		Length of Mains.
					Made.				Sold.										
		Coal Carbonized.	Coke for Water Gas.	Oil.	Coal Gas.	Water Gas.	Total Made.		To Prepayment Consumers.	To Ordinary and Power Consumers, &c.	For Public Lamps.	Total Sold.		Coke and Breeze.	Tar.	Sulphate of Ammonia.	Prepayment.	Ordinary.	
		Tons.	Tons.	Gallons.	1000 C.Ft.	1000 C.Ft.	1000 C.Ft.	Therms.	1000 C.Ft.	1000 C.Ft.	1000 C.Ft.	1000 C.Ft.	Therms.	Tons.	Gallons.	Tons.			Miles.
1920. . .	798	17,566,316	‡	‡	214,703,118	36,932,530	*256,977,744	‡§	77,911,168	150,562,911	6,928,745	235,402,824	‡§	‡	‡	‡	4,030,647	3,417,685	38,847
1921. . .	797	15,775,696	1,254,122	51,731,492	194,518,147	49,894,716	†249,019,732	‡§	80,285,658	141,768,032	7,023,422	229,077,112	‡§	10,404,702	160,376,472	115,979	4,071,220	3,488,090	39,547¾

* Including 5,342,096 thousand cubic feet of "Other gas." † Including 4,606,869 thousand cubic feet of "Other gas." § The number of therms made and sold by all undertakings cannot be given. ‡ Information not available.

GAS CONSUMERS AND THE RATING ASSESSMENT OF GAS UNDERTAKINGS.

By NORTON H. HUMPHRYS.

THE correct method of arriving at a fair and just valuation of gas undertakings as a basis for the use of the local rating authorities has been under constant discussion throughout the memory of the oldest inhabitant, and is no nearer to a unanimously accepted solution to-day than it was in 1873. Rarely have the figures submitted by opposition valuers approached agreement; and as a rule the ultimate decision is simply an incompetent and slashing compromise between widely diverse data. The subject has acquired further complication through the changed financial conditions that have been experienced by gas undertakings during the last seven years, and also increased importance, regarded as an item of expenditure, by the enormous advance in poundage rates which has been an equally prominent feature within that period. With diminished profits on the one hand, and anything up to 20s., 25s., or even 30s. in the £ on the other, the amount shown under the head of "Rates and Taxes" approaches, or may even exceed, the balance of income over expenditure. And examples could be quoted in proof of the assertion that the gas undertaking can be a greater source of profit to the local authority, through the medium of the rate collector, than it would prove under direct occupation and ownership. The authority may get more out of the undertaking than do the shareholders.

The gas undertaking is popularly supposed to represent the only interests prejudiced by excessive rating assessment. I have known a large consumer express delight because the gas-works assessment was increased. He was not friendly with the company, and therefore did not object to an extra burden on them, not realizing that a substantial portion of the increased charge would figure in his own gas bill. But let us follow the matter to the fountain head. Certain it is that the gas company "pay" the rate collector; but where do they get the needful? In the same sense the executive officer may be said to "pay" the coal bill. Administering trust funds, however, is not the same thing as dipping into the personal pocket. The payments for rates are included in revenue, not in profit and loss, and as such are a fixed charge on the receipts from customers, not on the shareholders. To these belong the balance after paying liabilities, or according to the notions pervading certain classes of the community to an extent that foreshadows trouble in the near future, to the State as a whole. An addition to assessment or to poundage can be paid from income, by the medium of increased selling prices; and this without any effect on the profit and loss account or the balance available for dividend. Virtually it will be paid by the customers, not by the undertaking.

The income side of the revenue account in the annual statement includes gas, residual products, rents of appliances supplied on hire terms, and a few insignificant sundries; and of these the first-named is the only "adjustable" item. The residuals are presumably sold at the highest prices that they will realize under current market conditions. The rents and sundries are comparatively small matters; and may be regarded as fixed charges. Therefore the burden of the rates is, or should be, entirely borne by the gas consumer.

But it happens that gas undertakings are not indifferent, uninterested, or in a position to regard substantial additions with equanimity. They do not raise the price of gas except as a final resort, because they have active competition to contend with. Note the extensive storage provided for petroleum products at every important railway centre, in conjunction with displays of improved oil burners and stoves in every ironmonger's shop, and especially that the sale of an appliance opens up the pleasing prospect of a regular customer for petroleum. Also that the price of gas affects sales in ways other than competition. Recent experience proves that a high price for gas not only favours rejection in favour of other agents, but leads to economy in use. Those who are not disposed to change, direct attention towards "doing without." The effect of a drastic restriction in supply does not disappear immediately on the restoration of normal service, but hangs about, perhaps for a year. There is an economic limit—between 6s. and 7s. per 1000 c.ft. in the South of England—beyond which the gain secured by a higher rate per 1000 c.ft. is more than offset by the loss attendant upon decrease in the quantity sold. Profits can be diminished by increasing the selling price, and full dividends do not synchronize with the maximum charges. Hence the common practice, and the advisability, of the shareholders accepting a part of the burden, if the price is already substantially above the average.

The gas consumer is directly interested in increased expenditure; but the strength and well-being of the undertaking are indirectly concerned to an equally important extent. The subject can be illustrated by reference to published analyses of gas-works accounts, showing the various items of expenditure in terms of per 1000 c.ft. sold, from which it will be seen that the purchaser of 1000 c.ft. of gas may pay anything from 1d. up to 1s. towards the local rates. I know one instance where the item for "rates and taxes" is equivalent to 1s. 1½d. per 1000 c.ft. sold; and this without regard to the fact that there was absolutely nothing in the way of profit for the owners during the years 1920 and 1921. And while about it, reference can be made to corresponding figures for 1910 and 1911. We shall find that, in a general sense, the gas consumer is paying two or three times as much towards the rates to-day as he did ten years ago.

The daily newspapers and other self-styled champions of the presumably ill-treated gas consumer—their favourite expression is to "protect" his interests—might render more valuable service by efforts in the direction of even and equable rating assessments than by agitations and Government inquiries into matters that are clearly explained by the Gas Regulation Act, 1920 (3d., from any stationer).

The Departmental Committee now sitting should consider the fact that gas undertakings have to meet increased expenditure, other than the bare advance on coal and labour, to an extent that renders it impossible to sell gas at rates based entirely on these conditions. Their failure to accomplish such a result appears to be the bedrock of the current artificial discontent.

Statutory gas undertakings are by necessity managed with a greater degree of justice and honesty, as viewed from the customer's standpoint, than is applied to average commodities as sold in the open market. Take the distributing charges of coal as an example—frequently much more than twice the price paid for the material at the pit bank. The coal that is sold to householders at £3 per ton is put on rail at a cost of less than £1. Gas companies are not in a position to form unions, combines, corners, and other modern artificial methods for increasing profits at the expense of the customers. The limited dividend and the published annual account compel them, by Act of Parliament, to be honest. Their policy remains unaltered and unaffected by the degradation of business morals, inaugurated by Government as a war-time necessity for raising money, which has made the Ishmaelite characteristic a prominent feature in modern commercial practice. The question in these days does not turn so much on a "fair" profit, or a "fair" price, as on the figure that the customer will "stand," or that will not prejudice business, which is as near the same thing as the economic limit above-mentioned. Such a change naturally increases or develops suspicion in connection with monopoly, which at the best of times is regarded with one eye only. The man in the street does not know the difference between regulated and unregulated monopoly; and therefore, while prominence is given to the advantages conferred on, and enjoyed by, the company, nothing is said about the benefits simultaneously assured to the public, or the obligations under which thousands of gas consumers have been supplied at less than cost for months on end.

A common saying is that the valuation of a gas undertaking can only be satisfactorily and fairly decided by an expert; but experience goes to show that a satisfactory decision is a *rara avis*. Seldom do any two experts agree within reasonable distance; and in the majority of contested cases the variations are so wide that they lead to unkind remarks on the general subject of "expert" evidence, and to the suggestion that it resembles statistics in being able to prove anything. To the best of their ability, they tip the scale in favour of their respective clients, but confuse rather than assist the assessors, who do not as a rule possess inside knowledge of gas finances. The final decision turns upon which way the cat jumps, and hence the differences instanced above.

According to theory, the assessment is based upon actual profits earned. In practice, if this starting-point is agreed on, which is about as common as for an income-tax assessor to be satisfied that the "net revenue" is a truthful representation of the taxable income, it is so manipulated as to become quite unrecognizable. An assessment or any other factor based on profits might reasonably be expected to show synchronous variation, and also to vary with the dividends paid to shareholders. The variations observed by comparing "rates and taxes" with "balance to profit and loss" should also show some agreement; but, as experts would probably expect, the lowest assessment tends to associate with the maximum rate of dividend. Under Provisional Charge Orders, at the best there was a *pro rata* reduction of dividend, and at the worst there was no dividend to reduce. An assessment based on profits should be affected in proportion; but I am not aware of any case in which the diminished intrinsic value has been taken into consideration by the rating authorities. The rate collector claims his pound of flesh, even when operations show actual loss. Comparisons extending over (say) the last ten years fail to show any connection between profits and rateable value.

An Act of Parliament cannot be satisfactorily administered unless expressed in definite terms; but a feature of the Rating Acts, and one largely responsible for the disputes to which they have given birth, is the redundancy of generalities. The endeavour to guard against the influence of temporary abnormal circumstances, by specifying that the basis of valuation shall be the rent at which the premises will let "from year to year," but no further instruction as to methods of determining the number of years implicated, leads to much confusion, because an average system that will assist towards a fair result must either be based on comparatively small or on synchronous variations that fall entirely within the limits concerned. If definitely stated as five, seven, or ten years, one period to form the basis for its successor, we should know what to do; but as things are, the professional adviser can select a period that will best serve his purpose. An expert acting on behalf of a gas undertaking to-day would advance argument in favour of a period of seven years; while his opponent might ask for 14 or 21 years. The decision on this point would substantially affect the ultimate result.

Of all the extraordinary, not to say ridiculous, assumptions that

* Including 5,342,096 thousand cubic feet of "Other gas." † Including 4,666,869 thousand cubic feet of "Other gas." § The number of therms made and sold by all undertakings cannot be given. ‡ Information not available.

have ever been incorporated in Acts of Parliament, that of the "hypothetical tenant" as applied to gas undertakings takes the cake; for all practical purposes the owner is the occupier, and letting on lease a thing of the past. In former times it was practised to a limited extent on conditions that do not greatly assist in determining rateable value; being based on the fact that an expert at gas-works management could do better for the shareholders, after allowing something for himself, than then existing extravagant or incompetent methods based on lines rendered familiar by modern Government control, which is invariably attended with high prices for the buyer, coupled with more or less dissatisfaction on the part of the seller. Witness the present state of the coal industry as a case in point. Certain gas undertakings, finding that their selling price was high, their service indifferent, and their profits so low that they could not raise capital for improvements or extensions, were glad to let on lease for a term of years, if a guaranteed dividend coupled with immediate outlay could thus be secured. Concerns that have been well and competently managed are not offered on lease, because there is no margin for the prospective lessee to work on. The average statutory rates of dividend on all classes of capital, which include A, B, C, &c., shares, debentures, and premiums not entitled to dividend, are too small to furnish both a landlord's and a tenant's fair profit. The hypothetical tenant is a will-o'-the-wisp.

That the gas undertaking uses the roads and occupies the subsoil is another crutch sometimes held out to support the remarkable system under which the rate collector takes precedence of the shareholder. But the right to use the roads for trade purposes is not special to the supply of gas. It is enjoyed by every merchant or tradesman in the district, many of whom cause more expense to the local authority for repair and upkeep than the gas company, who are liable for reinstatement of any disturbance of the soil to the satisfaction of the road authority. The municipality for the time being have no special interest in the subsoil other than representing the ratepayers, who, in their turn, are allowed free use of their own property. The fact that they occupy the subsoil by branch connections with the public sewers has never been brought forward as an item for rateable valuation. Apart from this, the gas undertaking is frequently the largest ratepayer, and as such might reasonably claim a "favoured nation" clause as compared with the average, most of whom are rated on one-tenth or less of their annual income.

The gas consumer pays the rates, and is directly interested in the price of gas, or in incidental matters only so far as they are related thereto. Some may well ask why they should be rated to near 1s. per 1000 c.ft., while friends in a similar neighbouring town pay only 1½d. They should know more about that part of the gas account that is passed on the rate collector through the medium of the gas office. And the attainment of a just assessment, distributing a fair and equitable proportion of the local burden, is, of course, to be found in the direction of a definite proportion between the amount of the "rate" and the quantity of gas used—or, to put the matter in another way, the number of 1000 c.ft. sold.

Coal Production in the United States.

The output of coal in the United States last year will show a total of about 410 million tons of bituminous, and 53 million tons of anthracite. These figures are quoted by Mr. Floyd W. Parsons in the "Gas Age-Record"; and he goes on to say that, comparing the year's production with that of 1921, there was a deficit last year of about 43 million tons. But placing the coal output of 1922 against that of 1920, the deficit in the year just closed amounts to approximately 196 million tons. Coke production last year was 45 p.ct. ahead of 1921, but 61 p.ct. behind 1920. The developments of the last four months indicate plainly that the American people possess great resourcefulness in time of emergency. Throughout the length and breadth of the land, fuel consumers have either turned wholly or partly to the use of substitutes for coal, or they have so improved their combustion practices as to net large fuel savings. It is estimated that fuel oil has displaced no less than 10 million tons of coal. The employment of wood for fuel has also largely increased. In recent years, wood has supplied about 15 p.ct. of the fuel used in the United States; and at the present time it is furnishing upwards of 20 p.ct. He expresses the opinion that the coal industry must necessarily suffer in a material way for its business shortcomings. Fuel consumers this winter are not only discovering new ways and means of cutting down coal consumption, but are learning the values of substitute fuels. Thousands of homes that formerly consumed anthracite are now burning coke, gas, or oil. Many of these people will not go back to hard coal.

Gas Light and Coke Company's Dividend.—The accounts of the Gas Light and Coke Company for the past year (the main portions of which will be found elsewhere in this issue) show that the balance to the credit of the net revenue account will enable the Directors to recommend the payment of dividends for the half year to Dec. 31 last as follows: On the 4 p.ct. consolidated preference stock, at the rate of 4 p.ct. per annum; on the 3½ p.ct. maximum stock, at the rate of 3½ p.ct. per annum; and on the ordinary stock, at the rate of £5 4s. p.ct. per annum—carrying forward to the next account the sum of £244,355 3s. 3d.

LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.

There was a crowded meeting of the Association at the Westminster Technical Institute, Vincent Square, S.W., last Friday evening, under the presidency of Mr. D. CLEAVE CROSS.

CONGRATULATIONS.

The PRESIDENT said that, before proceeding with the business, he was sure those present would wish to offer their heartiest congratulations on his new appointment to Mr. S. B. Chandler, who had for a long time past been one of the hardest working members of the Association, and who had done as much for it as, or more than, any other member they had had. He was President during the difficult period of the war, and did yeoman service. It was pleasing to see a man of his ability really appreciated, and to know that he had secured a position which all felt proud that a member of their Association should attain to—that of Distribution Superintendent of the Tottenham District Light, Heat, and Power Company.

Mr. CHANDLER thanked the President for his kind remarks, and the members for the cordial manner in which they had received them. While acknowledging their congratulations, he would like to take the opportunity to testify to the value of the Junior Associations—and particularly the London. He had been for some years connected with this Association, and had thereby obtained a great deal of knowledge. He hoped always to be regarded as "one of them."

FROM THE GASHOLDER TO THE HOUSEHOLDER.

The PRESIDENT remarked that they were very pleased to have with them their old patron and very good friend, Mr. A. F. Browne. Those who were connected with the Association before the war would remember that none among their patrons gave them greater help than did Mr. Browne; and though he had now retired from active work, he retained his interest in the doings of the juniors.

Proceeding, the President said it would be recalled that on the occasion of their visit to Brighton last summer, the catering arrangements were in charge of Mr. P. E. Browne, the Distributing Engineer to the Brighton and Hove General Gas Company, who carried them out in an excellent manner. Now he had been good enough to come up to London to give them a paper. Among the seniors he had heard him referred to as one of the leading young distribution engineers in the industry, and so they were certain to hear something worthy of closest attention.

Mr. BROWNE then read his paper, which, with some points from the animated and practical discussion which followed it, will be found on p. 267. The various forms referred to in the paper were shown on the screen.

Mr. S. B. CHANDLER, proposing a hearty vote of thanks to the author, said they had never had a better paper on distribution. Quite recently he had seen Mr. Browne at Brighton, and been permitted to investigate some of his methods; and he had been very much struck with his thorough grasp of detail. He was a co-partner in the true sense of the word, and dealt with his men in a humane manner. All the men who worked under him must feel quite confident that by going to him they would receive not only help but sympathy—and sympathy was of very great value to everyone, whatever might be the position he occupied. The members would remember that, during their visit to Brighton, Mr. A. M. Paddon (the Chairman of the Company) mentioned the distribution department as being presided over by "our distinguished Engineer Mr. Browne."

Mr. W. L. WESTBROOK seconded the vote, which was carried with applause.

Mr. BROWNE, returning thanks, said Mr. Chandler was an old colleague of his in the South Metropolitan Gas Company. Certainly he (the speaker) did try to give his men sympathy. It was by the performances and behaviour of the men right through the piece that the gas undertaking was judged. They should all treat these men, not as mere cogs in a wheel, but as human beings, and try to induce them to incorporate in their work a real enthusiasm.

Leeds University Experimental Gas Plant.—Messrs. Clayton, Son, & Co., Ltd., of Leeds, have given 500 guineas, and the Tottenham District Light, Heat, and Power Company 250 guineas, towards the cost of the experimental coal-gas plant, for investigation of problems in the carbonization and gasification of coal, which is being erected by Mr. Henry Woodall at Leeds University in memory of Sir Corbet Woodall.

Iron and Steel Institute.—The annual meeting of the Institute is fixed for May 10 and 11, at the Institution of Civil Engineers, Great George Street, S.W.; and it is hoped to hold the autumn meeting in Italy about the middle of September. Members are reminded that in March the Council will be prepared to consider applications for grants from the Carnegie fund in aid of research work on some subject of practical importance relating to the metallurgy of iron and steel, or allied subjects. Special application forms can be obtained from the Secretary of the Institute, at No. 28, Victoria Street, S.W. The results of research work must be communicated to the Institute in the form of a report.

GAS LIGHT AND COKE COMPANY.

Annual Report and Accounts.

THE following is the report of the Directors of the Gas Light and Coke Company for the year ended Dec. 31, which will be presented at the Ordinary General Meeting next Friday.

The accounts for the year show that after paying, in respect of the June half year, dividends at the rate of 4 p.ct. per annum on the 4 p.ct. preference stock, 3½ p.ct. per annum on the 3½ p.ct. maximum stock, and £5 4s. p.ct. per annum on the ordinary stock, and after contributing a sum of £20,000 to the redemption fund, there is a total available balance of £843,360 9s. 6d., out of which the Directors recommend the payment of the following dividends in respect of the December half year: On the 4 p.ct. preference stock, at the rate of 4 p.ct. per annum; on the 3½ p.ct. maximum stock, at the rate of 3½ p.ct. per annum; and on the ordinary stock, at the rate of £5 4s. p.ct. per annum; which, together with an amount of £22,061 9s. 10d. (equal to 5s. 4d. p.ct. per annum on the ordinary stock) to be carried to the reserve fund, and a further sum of £20,000 to be contributed to the redemption fund, will absorb £599,005 6s. 3d., and leave £244,355 3s. 3d. to be carried forward to the credit of the current year.

The Company, after having given the necessary three months' notice, increased the calorific value of the gas on June 15 last from 475 B.Th.U. to 500 B.Th.U. per cubic foot.

The price of the Company's gas at the end of 1921 was 1s. 2d. per therm, and is now 10d. per therm. The price per 1000 c.ft. at the corresponding date was 5s. 6½d., and is now 4s. 2d.

Owing to an agitation with regard to the therm method of charge, the Board of Trade appointed, in November last, a Departmental Committee to inquire into the method of charging for gas on a thermal basis. This Committee is now sitting, and is expected to report shortly.

The Directors regret to report that the Rt. Hon. Sir Daniel Ford Goddard, who had been a Director of the Company for six years, died on May 6 last. In him the Directors have lost a most valuable colleague. The Directors elected Mr. Harold Brewer Hartley, C.B.E., M.C., in his place.

The Order under section 10 of the Gas Regulation Act, 1920, authorizing the acquisition by the Company of the Ilford Gas Company, and for other purposes, passed through both Houses of Parliament, and is now in force; the amalgamation having taken place on July 1 last.

There has been an increase during the year of 29,206 consumers, including 16,766 taken over from the Ilford Gas Company at the date of amalgamation, and of 78,943 gas-stoves sold and let out on hire, including 14,000 taken over from the Ilford Gas Company at the same date.

DAVID MILNE WATSON,
Governor.

Horseferry Road, Westminster, S.W. 1, Jan. 27, 1923.

The Accounts.

The statement of capital (stock) sets forth that the total paid-up is £10,588,420; added on conversion, £12,941,060—total amount authorized, £23,529,480. Deducting the amount redeemed, £321,125, the total amount of the Company's existing capital powers is £23,208,355. The statement of loan capital stands thus: Total paid-up, £3,294,160; added on conversion, £1,639,770; **remaining** unissued, £750,000—total amount authorized, £5,683,930.

CAPITAL ACCOUNT.

The capital account shows receipts (with premiums, £1,707,183) to the amount of £29,849,468. The expenditure is shown in the following items:

	Expended this Year.	Total to Dec. 31, 1922.
Expenditure to Dec. 31, 1921—The Gas Light and Coke Company		£14,939,261 19 9
Expenditure to June 30, 1922—The Ilford Gas Company		363,922 16 8
		£15,303,184 16 5
Expenditure during the year to Dec. 31, 1922—		
New and additional mains and service-pipes	£54,820 9 1	
Do. do. meters	84,548 17 7	
Do. do. stoves	186,731 13 5	
		326,101 0 1
		£15,629,285 16 6
By amount written off plant	£365,846 9 9	
„ depreciation of stoves	50,154 0 0	
		416,000 9 9
Total expenditure		£15,213,285 6 9
Nominal amount added on conversion		14,580,830 0 0
		£29,794,115 6 9
Deduct amount of capital redeemed under the Gas Light and Coke Company's Act, 1903—		
Per previous account	£285,225 0 0	
This year	35,900 0 0	
		321,125 0 0
		£29,472,990 6 9
Balance of capital account		376,477 17 11
		£29,849,468 4 8

REVENUE ACCOUNT.

Revenue.

Year, 1921.		£ s. d.	£ s. d.
£7,882,792	Sale of gas— Per meter at 1s. 1d., 11d., and 10d. per therm	7,253,268 10 7	
233,954	Public lighting and under contracts	235,579 9 7	
8,116,746			7,488,848 0 2
168,049	Rental of meters	..	180,071 14 11
196,014	Rental of stoves	..	219,425 4 1
306,369	Rental of fittings	..	308,471 16 5
1,953,339	Residual products— Coke, less labour, &c.	1,377,361 3 9	
159,909	Breeze, less „ „	105,201 19 9	
225,030	Tar and tar products	273,633 5 10	
130,861	Ammoniacal liquor and sulphate of ammonia	130,438 12 7	
2,509,139			1,886,635 1 11
29,448	Rents receivable		26,057 11 9
598	Transfer fees		844 18 0
11,326,363			10,110,354 7 3

Expenditure.

Year, 1921.		£ s. d.	£ s. d.
£4,220,732	Manufacture of gas— Coal, including expenses and special depreciation of ships	3,150,328 17 5	
521,372	Oil „ „ less value of oil tar	204,161 5 5	
484,556	Coke, &c., used in the manufacture of carburetted, &c., water gas	333,515 2 0	
73,594	Salaries of engineers and other officers at works	72,327 11 2	
543,727	Wages	391,733 13 5	
78,630	Purification	60,496 10 10	
1,641,023	Repair and maintenance of works and plant, less received for old materials, £8,757 4s. 11d.	1,690,512 15 0	
			5,903,075 15 8
338,497	Distribution of gas— Salaries and wages (including rental clerks)	316,301 5 7	
455,940	Repair and maintenance of mains and service-pipes, &c.	459,246 5 2	
271,217	Repair and renewal of meters	234,490 8 5	
272,658	„ „ stoves	351,064 15 9	
36,397	Fitting up automatic meter supplies	47,070 6 3	
			1,408,173 1 2
157,530	Public lamps—lighting and repairing	..	125,271 6 8
16,357	Rents, rates, and taxes— Rents payable	18,573 10 0	
576,337	Rates and taxes	561,610 19 1	
			580,184 9 1
8,550	Management— Directors' allowance	8,750 0 0	
683	Company's Auditors and assistant	600 0 0	
49,367	Salaries of management staff	46,601 17 0	
165,903	Collectors and cashiers	141,616 4 0	
38,871	Stationery and printing	32,580 15 10	
49,881	General charges	41,883 4 10	
			275,032 1 8
64,963	Co-partnership	..	57,115 3 1
412	Parliamentary charges	..	932 16 0
2,001	Law charges	..	1,374 5 6
869	Charges *re* quinquennial re-valuations	..	..
8,847	Bad debts	..	11,744 16 5
1,000	Depreciation fund for works on leasehold lands	..	1,000 0 0
86,209	Annuities to officers and workmen, including contribution to officers' superannuation fund	..	118,779 15 8
8,827	Workmen's compensation	..	9,202 16 4
31,617	Contributions under National Insurance Acts	..	41,801 4 11
..	Expenses *re* Ilford Amalgamation	..	49,188 18 10
5,191	Public officers, &c.— Contribution under Gas Regulation Act, 1920, and Official Auditor	4,953 5 1	
1,560	Public testing-stations	2,339 9 11	
			7,292 15 0
10,213,338			8,590,169 6 0
1,113,025	Balance carried to net revenue account		1,520,185 1 3
11,326,363			10,110,354 7 3

Total Wages Paid 1922, £2,297,878. Total Salaries Paid 1922, £475,504.

NET REVENUE ACCOUNT.

The total of the net revenue account is £1,689,093. The following statement shows how it is appropriated:

Year 1921.			
£156,130	..	Interest on debenture stocks and bonds for the year	£156,126 14 0
..	..	Amount carried to Special Purposes Fund	50,000 0 0
94,586	..	Interest on temporary loans and sundry funds, less credits	70,021 14 5
		Dividend, &c., for the half year to June 30, 1922:	
81,245	..	Dividend on the 4 p.ct. consolidated preference stock, £81,244 14s.	
45,500	..	Dividend on the 3½ p.ct. maximum stock, £45,500	
10,000	..	Contribution to redemption fund, £20,000	
£4 13s. 4d. per cent.	..	Dividend on the ordinary stock (£5 4s. p.ct. per annum), £422,839 19s.	
380,309			
517,054			569,584 13 0
672,102	..	Balance applicable to redemption fund and to dividends, December half year, 1922	843,360 9 6
£1,439,872			£1,689,093 10 11

Proposed Appropriation of Balance on Net Revenue Account, Dec. 31, 1922.

Year 1921.		£ s. d.	£ s. d.
£672,102	Balance	..	843,360 9 6
	Amount required for dividends, &c., for the half year to Dec. 31, 1922:		
£81 245	Dividend on the 4 p.ct. consolidated preference stock	81,244 14 0	
45,500	Dividend on the 3½ p.ct. maximum stock	45,500 0 0	
10,000	Contribution to redemption fund .	20,000 0 0	
..	,, reserve fund . . .	22,461 9 10	
£4 13s. 4d. p.ct. £380,309 Ilford £6,640	Dividend on the ordinary stock, £5 4s. p.ct. per annum on £16,546,120	430,199 2 5	
£523,694			599,005 6 3
£148,408	Balance carried to next year's account .	..	£244,355 3 3

The four statements relating to the redemption, reserve, special purposes, and depreciation funds stood as follows on Dec. 31; Redemption fund, £40,000; reserve fund, £93,424; special purposes fund, £457,184; depreciation fund, £105,679.

The remaining statement is the balance-sheet, which gives the value of the stores on hand at the close of the year as follows: Coal, £328,196; gas oil, £75,478; coke, £34,199; tar and ammoniacal liquor and products, £120,102; sundry stores, £724 811. The figures this time last year were: Coal, £373,630; gas oil, £74,030; coke, £45,694; tar and ammoniacal liquor and products, £175 348; sundry stores, £838,752.

Statement of Coal.

—	In Store* Dec. 31, 1921.	Received during Year.	Carbonized during Year.	Used during Year.	In Store Dec. 31, 1922.
	Tons.	Tons.	Tons.	Tons.	Tons.
Coal	186,316	1,945,347	1,897,635†	4619	233,039

* The Ilford Gas Company, June 30, 1922: 3630 tons.
† In addition to this quantity of coal, 11,613,240 gallons of oil have been used during the year.

Statement of Residual Products.

Description.	In Store,* Dec. 31, 1921.	Made during Year.	Used during Year.	Sold during Year.	In Store Dec. 31, 1922.
Coke—tons	30,426	1,211,379	201,154	1,007,332	34,199
Breeze—tons	13,958	235,240	27,319	214,146	7,953
Tar, from coal only—galls.	2,488,422	17,658,782	17,039,367	162,385	3,041,034
Ammoniacal liquor—butts	33,911	502,567	507,126	25	29,676

* The Ilford Gas Company, June 30, 1922: Coke, 880 tons; breeze, 220 tons; tar (from coal only), 95,582 galls.; ammoniacal liquor, 349 butts.

Statement of Gas Made, Sold, &c.

		Quantity Made.	Quantity Sold.			Quantity Used on Works, &c.	Total Quantity Accounted for.	Quantity Not Accounted for.	Number of Public Lamps.
			Public Lights and Under Contracts (Estimated).	Private Lights (per Meter).	Total Quantity Sold.				
1922.	Cubic feet (thousands) .	† 35,487,465	861,291	31,452,253	32,313,544	544,441	32,857,985	2,629,480	44,252
	Therms . . . . . §	174,324,718	4,237,499	154,518,370	158,755,869 *(157,721,353)	2,672,857	161,428,726	12,895,992	..
1921.	Cubic feet (thousands) .	33,734,287	887,838	29,757,633	30,645,471	536,190	31,181,661	2,552,626	44,150
	Therms	162,420,301	4,277,023	143,272,911	147,549,934	2,581,622	150,131,556	12,288,745	..

* At declared calorific value—viz., { 475 B.Th.U. per cubic foot from Jan. 1—June 14. / 500 ,, ,, ,, June 15—Dec. 31.
† Including 10,996,310 thousands of carburetted, &c., water gas.
§ At actual calorific value—viz., 491 B.Th.U. per cubic foot.

NEW WOODALL-DUCKHAM VERTICAL RETORTS AT PAISLEY.

At a meeting of the Paisley Town Council on Feb. 15, 1921, the recommendation of the Gas Committee to procure an installation of vertical retorts was agreed to; and this decision was arrived at following the presentation of a report on the subject by the Gas Engineer, Mr. A. S. Nisbet. The work was in due course put in hand; and on Nov. 30 last an installation constructed on the Woodall-Duckham system was brought into operation. It consists of one bench of seven settings, each of which contains four retorts, the whole being capable of carbonizing up to 140 tons of Lanarkshire or Ayrshire coals per day.

This extension to the carbonizing plant has been placed in a coal-store adjacent to the existing horizontal retort-house, which position enabled the new plant to be completely erected and brought into operation without in any way interfering with the old horizontal settings. The installation of this plant will enable the old settings to be dispensed with and demolished; the old retort-house then being utilized as a coal-store, taking the place of the store now accommodating the new verticals.

The settings, which are of the Woodall-Duckham latest type, in which four retorts are heated from one producer—each retort being provided with its own producer gas, secondary air, and waste gas control, so that any one can be worked or regulated at will without affecting those adjacent—are contained in a steel-framed extension of the existing coal store. This framework is panelled in the usual way with brickwork; the roof being covered with corrugated asbestos sheeting and patent glazing.

In designing the coal and coke handling machinery for this plant, advantage was taken of the existence of an elevated railway gantry on which coal is brought in trucks from the railway sidings. The retort-bench was placed approximately at right angles to this gantry and encircled by a gravity bucket conveyor, which deals with all the coal and coke.

The railway trucks, being of the end door type, are mechanically emptied of their contents by means of an electrically-operated ram tipper. The ram of this tipper has connected to it a steel cradle which, after the ram has lifted one end of the wagon a certain distance, comes into contact with the front axle and lifts the front end of the wagon sufficiently clear of the rails to ensure the front buffers not fouling them, enabling the wagon to be tipped to such a degree that all the coal will automatically slide out without any hand raking.

The coal, on falling from the wagons, passes into a receiving hopper suspended from the gantry, and thence through a four-roll breaker capable of dealing with 45 tons per hour. The feed from the receiving hopper to the breaker is by means of a jigger having a screen bottom, whereby all fine and small coal is by-passed, and falls with the broken coal into the gravity bucket conveyor. This conveyor elevates the broken coal, and feeds it

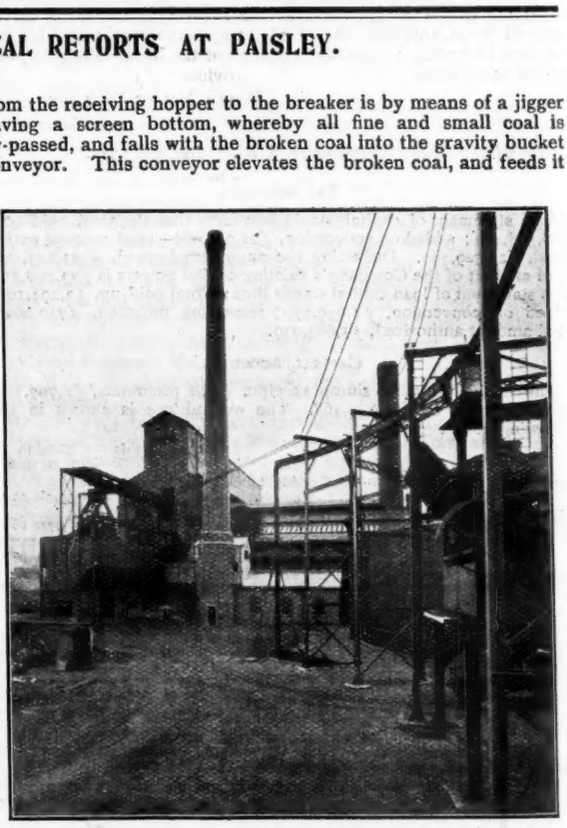


Fig. 1.—Outside View—The Waste-Heat Boiler-House and Coke-Storage Bunkers.

into the overhead storage hoppers, which are of 48 hours' capacity. From these storage hoppers the coal is fed in the usual way through auxiliary hoppers attached to the top mouthpiece of

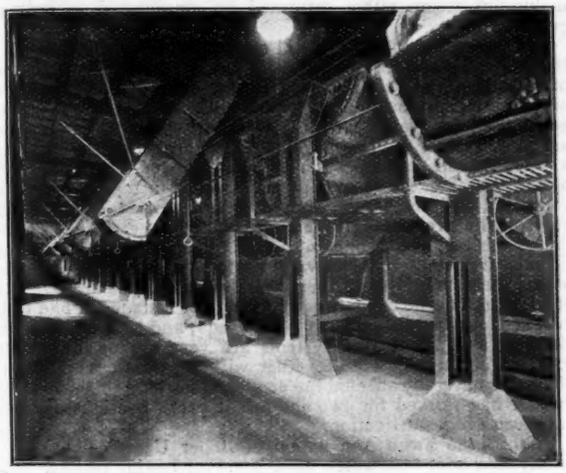


Fig. 2.—The Discharging Floor, showing Coke Doors and the Clinker Shoots.

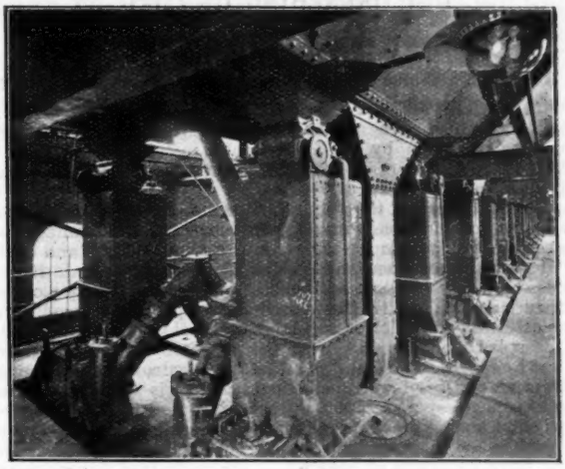


Fig. 3.—Top of the Setting, showing the Feed Hoppers.

the retorts; its speed of travel through the retort being regulated by the rate of extraction of the coke at the bottom.

The coke is discharged cool and dry from the retorts, at intervals of two hours, through a special travelling rotary filler directly into the gravity bucket conveyor, which runs in a trench in the retort-house floor. The coke required for the producer fires, or for filling the retorts at starting-up or after scurfing, is elevated by the conveyor and fed into the overhead storage hoppers, from the coke compartments of which it is fed directly, through fixed shoots with quadrant doors at their ends, into the producers.

The remaining coke is dealt with in one of two ways. If it is being dispatched from the works by rail, it is discharged from the conveyor through a shoot directly into wagons on the elevated gantry at the end of the retort-house. If it is being sent in the ordinary way into carts or wagons, or being put into store, it is discharged into a series of elevated steel hoppers placed at the opposite end of the retort-house to the railway sidings. The shoots discharging the coke into these hoppers are fitted with bar screens for extracting the breeze, which falls into separate compartments.

As a stand-by to the coal and coke elevating plant, a 30-cwt. electric lift is provided in the retort-house, by means of which coal and coke in skips can be elevated to the overhead storage hopper level. In addition, the lift provides for passenger service, giving ready access to all the main working levels.

The producers are of the usual step-grate pattern, the use of which entirely eliminates the arduous work of clinkering.

Working in conjunction with the settings is a waste-heat boiler, which is capable of providing the whole of the steam required in the retort-house and leaving a surplus available for other purposes about the works. It is of the Woodall-Duckham standard design, being of the multi-tubular fire-tube type, and is capable of raising 2600 lbs. of steam per hour at 120 lbs. per square inch pressure. The induced draught fan working in conjunction with the boiler is driven by means of a variable-speed electric motor, which allows absolute control over the draught on the settings.

The whole of the coal and coke handling machinery, in addition to the waste-heat boiler fan, being electrically driven, the electric generating plant existing on the works before the vertical installation was adopted was found to be too small to meet all requirements. It was therefore extended by the addition of a 55 KW. set, driven by a 95 B.H.P. horizontal gas-engine of the National Gas-Engine Company's manufacture.

All the above work has been carried out by the Woodall-Duckham Vertical Retort and Oven Construction Company (1920), Ltd., in collaboration with Mr. A. S. Nisbet, the Engineer to the Paisley Corporation Gas Department.

The Opening Ceremony.

The opening ceremony took place last Friday, when Provost Lang and Bailie Glover (the Convener of the Gas Committee) each operated a lever which had the effect of putting two retorts in action. Sir William Jones, on behalf of the contractors, presented to the Provost a rosebowl, and to Bailie Glover a silver tea service. After an inspection of the works, a party of about eighty lunched at the Town Hall—Provost Lang in the chair.

Sheriff WELSH, proposing "The Town Council," said the function they had just attended showed the Council were ready to take any steps that would tend to promote the welfare of the community in general.

Provost LANG, in acknowledgment, remarked that when the Council decided to go in for these retorts, they knew that if they waited two or three years they would get them much cheaper; but their motto being "Security first," and not knowing whether the old retorts would be able to meet the winter demand, they placed their order. They were proud of the heads of their departments.

Major J. H. YOUNG submitted "The Gas Committee," and expressed the opinion that Bailie Glover's force of character had carried through to a large extent the purpose which they had in view, and had overridden the difficulties which always accompanied such a gigantic enterprise.

Bailie GLOVER stated that, after careful consideration and calculation, it was proved beyond a doubt that vertical retorts would provide smoother working and produce cheaper gas than the horizontal retorts. Two gentlemen who were greatly interested in this work had passed away ere it was accomplished—Bailie Henderson, late Convener, and Mr. George R. Hislop, late Manager. Two better and more enthusiastic men for their respective positions Paisley never had. It would have rejoiced their hearts to see the splendid start made to-day by the new process of gas making. The work had been carried out by the Woodall-Duckham Vertical Retort Company, under the supervision of the Gas Manager. It had been completed a month within the time specified, and to their entire satisfaction. The success of the Paisley gas undertaking had been largely due to the continuity of management at the works. Mr. Hislop was Manager to the private Company when the Town Council bought the concern in 1870, and his valuable services were retained by the Corporation up to 1918, when he retired after 53 years' faithful service. He was one of the leading gas experts in the country, and retained the confidence of all concerned to the end of his long and useful life. Happily their present Manager, who was trained under Mr. Hislop, was well qualified to fill the vacant position. Mr. Nisbet, besides being a first-class chemist, was an adept at gas making, and the Corporation made a wise selection when they appointed him Manager of the works. He was always at his post, and faithfully did his duty.

Bailie M'GEORGE, proposing "The Contractors," said he believed the general opinion after the inspection of the retorts that day would be that the Town Council had a very good job. The Woodall-Duckham Company had a world-wide reputation, and their plant had been accepted by the Corporation from open competition. The various sections of the work had been completed under the supervision of able men, who had discharged their duties in a manner worthy of the reputation of the Company.

Sir WILLIAM JONES, in reply, remarked that nothing could make for the better administration, prosperity, and comfort of a community so much as a united Council and a devoted staff. Small wonder was it, therefore, that his firm and his colleagues in business should regard this as a very happy occasion.

Death of Mr. James W. Helps.—A letter has been received by the President of the Institution of Gas Engineers (Mr. James D. Smith) from the President of the Société Technique de l'Industrie du Gaz en France (M. Robert Ellissen), expressing the sympathy of his members on the occasion of the death of Mr. James W. Helps, who was well known to many of them.

Commercial Gas Company's Dividend and Price.—The Directors of the Commercial Gas Company will recommend at the annual general meeting the payment of dividends for the half year to December last at the rate of 6 p.ct. per annum on both the 4 p.ct. and the 3½ p.ct. stocks of the Company, making £5 16s. p.ct. and £5 15s. p.ct. respectively for the year 1922. The price of gas has been reduced during the year 1922 from 1s. 3d. to 10d. per therm; and a further reduction of ¾d. per therm, equalling nearly 2d. per 1000 c.ft., has been made from Jan. 1, 1923, making the present price 9⅜d. per therm, or 3s. 9½d. per 1000 c.ft.

Scottish Junior Gas Association.—A joint meeting of the Eastern and Western Sections will take place in the Royal Technical College, Glasgow, on Saturday afternoon, Feb. 10, when Dr. E. W. Smith, F.I.C., will give an address on "Difficulties in Daily Routine." He has invited members to send in written questions on any subject relating to the gas industry, so that they may be dealt with at the meeting.

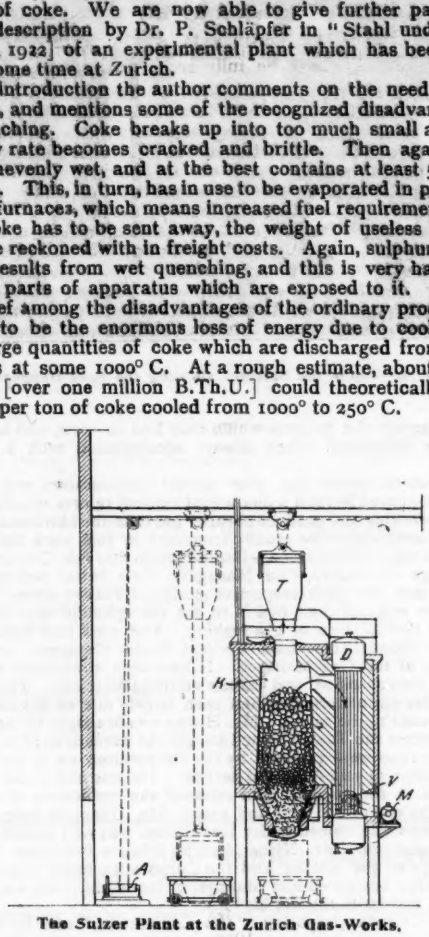
Reports Held Over.—Among matter which has unfortunately to be held over this week are reports of a meeting of the Yorkshire Junior Gas Association, at which Mr. H. L. Bateman delivered his Presidential Address, and of a visit of the Scottish Junior Gas Association (Western District) to the Bonnington works of Messrs. Peebles & Co., Ltd.

DRY QUENCHING OF COKE.

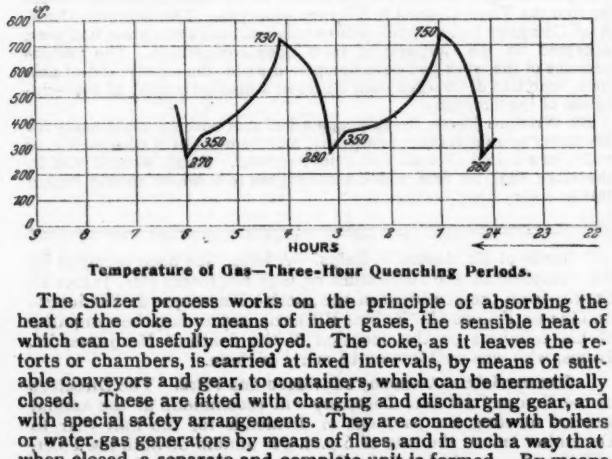
The Sulzer Plant at Zurich.

Reference was made in the "JOURNAL" for Jan. 10 [p. 82] to the process patented by the firm Gebrüder Sulzer for the dry cooling of coke. We are now able to give further particulars from a description by Dr. P. Schläpfer in "Stahl und Eisen" [Aug. 17, 1922] of an experimental plant which has been working for some time at Zurich.

In his introduction the author comments on the need for fuel economy, and mentions some of the recognized disadvantages of wet quenching. Coke breaks up into too much small and dust, or at any rate becomes cracked and brittle. Then again it becomes unevenly wet, and at the best contains at least 5 p.ct. of moisture. This, in turn, has in use to be evaporated in producers or blast-furnaces, which means increased fuel requirements; and, if the coke has to be sent away, the weight of useless moisture has to be reckoned with in freight costs. Again, sulphurous acid always results from wet quenching, and this is very harmful to any iron parts of apparatus which are exposed to it. But perhaps chief among the disadvantages of the ordinary process may be said to be the enormous loss of energy due to cooling with water large quantities of coke which are discharged from retorts or ovens at some 1000° C. At a rough estimate, about 280,000 calories [over one million B.Th.U.] could theoretically be recovered per ton of coke cooled from 1000° to 250° C.



The Sulzer Plant at the Zurich Gas-Works.



Temperature of Gas—Three-Hour Quenching Periods.

The Sulzer process works on the principle of absorbing the heat of the coke by means of inert gases, the sensible heat of which can be usefully employed. The coke, as it leaves the retorts or chambers, is carried at fixed intervals, by means of suitable conveyors and gear, to containers, which can be hermetically closed. These are fitted with charging and discharging gear, and with special safety arrangements. They are connected with boilers or water-gas generators by means of flues, and in such a way that when closed, a separate and complete unit is formed. By means of special fans, introduced at suitable points, the air enclosed in each system can be made to circulate at a required velocity. In its first passage through the incandescent coke, the oxygen of the air combines to form carbon dioxide and carbon monoxide. If the apparatus is air-tight, therefore, there is no further combustion of the coke during the cooling period. It is only when more coke is introduced that a little more air enters the apparatus. The inert gases circulate in the closed circuit until the coke is cooled to 250° C., and the heat which they take from it they give up again to the boiler. As the velocity of the gases can be regulated, the hourly steam production can be controlled, in spite of the filling and emptying of the coke containers. They are so well insulated that coke can be left in them for considerable periods without much reduction in temperature. It has even been shown by tests that steam production can be altogether suspended from time to time. But to work in this way, the containers must naturally be large enough to receive the greater quantities of coke which will accumulate for cooling. The process permits of the making of steam either saturated or superheated to ordinary pressures.

In 1919 an experimental plant on these lines was introduced at the Zurich Gas-Works, to deal with a daily production of 25 tons of coke from a battery of vertical ovens. A vertical section of the arrangement is shown diagrammatically in fig. 1. The incandescent coke is conveyed from the ovens in special skips T, which are run on small trolleys on rails. They are raised by means of a winch A, and emptied when in position over the charging lid of the container K. The boiler D is walled-in together with the container, and the fan V, worked by a motor M, actuates and controls the circulation of the inert cooling gases. When cooled, the coke is emptied through a hand-manipulated discharging door situated at the bottom into a waiting skip, and is then ready for disposal. Being merely for experimental purposes, the arrangement of the plant lays no claim to perfection. For instance, it had to be installed at some distance from the ovens; and the conveyor and charging and discharging systems are very crude, and require constant attention. This, together with the small scope of the plant, has naturally affected the economic working results. However, it has worked for two-and-a-half years continuously, and has given every satisfaction.

In 1920, the Swiss Association of Boiler Users carried out a twenty-four hour test, which gave some interesting results. The following are taken from a report of the Association:

Capacity of coke container	10 cub.m.	353 c.ft.
Boiler heating surface	114 sq. m.	1226 sq. ft.
Retorts emptied (15-hour carbonization period)	66	
Net weight of coke	22,360 kilos.	22 tons.
,, ,, ,, (per retort)	338·9 ,,	66 cwt.
Feed-water (at 43·8° C.)	10,980 ,,	11 tons.
Mean steam pressure	5·4 atm.	77 lbs. per sq. in.

1 kilo. coke converted 0·472 kilo. water at 0° C. into steam 100° C.
Heat utilized per kilo. of coke 302 cal.—543 B.Th.U. per lb.

The circulating gases were analyzed from time to time, typical results being:

—	Minimum.	Maximum.	Shortly Before Discharge of Cooled Coke.	Directly After Charging with Incandescent Coke.
	P.Ct.	P.Ct.	P.Ct.	P.Ct.
CO_2	11·0	16·0	14·1	11·4
O_2	0·0	3·6	1·1	0·6
CO	0·8	15·4	2·4	15·4

The hotter the coke, the poorer are the gases in oxygen. The CO_2 and CO contents likewise depend on the temperature of the coke. When the container is first charged, part of the CO_2 is reduced to CO—thus, $CO_2 + C = 2CO$. At the beginning, therefore, of the quenching period the proportion of CO is on the increase. As the coke cools, part of the CO may still be subject to combustion—thus, $CO + O = CO_2$, since little or no air is admitted with each fresh charge. Hence constant slight variations of temperature have to be reckoned with during the process. Continuous combustion is, however, not taking place in the container, since it is air-tight when closed. Temperature curves of the cooling gases show that no continued combustion of the coke actually does take place, as the great difference which this would make could be detected without difficulty. The curves actually show that the temperature rises quickly after charging from 260° or 280° C. to about 730° or 750° C. at the end of the first hour, and falls slowly in the next two hours to the discharging temperature. If combustion of the coke continued, the curves would not show such sharp points when the top temperature is reached.

The working results for a 17-day period are set-out in some detail, and they may be summarized as follows: 23·6 tons of coke quenched and 9·4 tons of water at 50° C. converted into steam at 6·3 atm. [90 lbs. per sq. in.], or 0·398 unit by weight of steam produced per unit by weight of coke cooled. A 285-day period gave 0·383 unit of steam per unit of coke, the feed water being at 50° C. and the steam at 6·4 atm. These figures support the makers' claim that their plant can, in average conditions, produce 300 to 400 kilos. [660 to 880 lbs.] of saturated steam, according to coke temperatures, per ton of coke. As already explained, the Zurich plant was not laid-out to any great advantage.

The makers of the plant were able to gather from the installation important data for improvements in subsequent designs. Among other things, alterations were found necessary to reduce friction and facilitate discharge of the coke, and to adjust the heating surface of the boiler to the correct proportions for each plant. As to the suitability of the system for any particular works, this, the writer contends, must depend on individual circumstances. He does not consider it worth while to attempt to give general costs of installation or working, as these, also, must differ so largely in different cases. That the makers consider their system has reached the practical stage, and that they have convinced others of this, is evident from the description, with which the article concludes, of several larger-scale installations, some of them merely designed, and some actually being constructed. These include a quenching plant for a battery of inclined ovens at a gas works for 200 tons of coke a day; one for horizontal chambers of 150 tons a day; and another for a coke-works which is to produce 1000 tons a day. This larger plant is intended to supply the whole works with its steam and electric requirements.

SCOTTISH JUNIOR GAS ASSOCIATION

(EASTERN DISTRICT).

Meeting at Dunfermline.

A Meeting of the Association was held at Dunfermline on Saturday, Jan. 13, when the attendance was up to the average. A novel idea was hit upon by the Association officials; and with the hearty co-operation of Mr. James Campbell (the Engineer) and his assistants, a very interesting and instructive time was spent. The members were welcomed by Mr. Campbell, and each was given a plan of the works and found his own way about. Every appliance and apparatus was labelled, giving the name of the maker, &c. Members were requested to make notes, and any inquiries were to be answered at the meeting which followed.

Woodall Duckham retorts are installed, the whole bench being capable of carbonizing 110 tons per day. The old horizontal bench is practically demolished, the building being converted into a coal-store. A new four-lift spiral guided holder, capable of storing 1¼ million c.ft., is in course of erection. Messrs. R. & J. Dempster, of Manchester, are the contractors. The sulphate of ammonia plant is equipped with a Broadbent centrifugal drier. The works supply an area covering over 15 square miles, and new high-pressure schemes of distribution are under consideration. The price of gas is 2s. 10d. per 1000 c.ft., which compares very favourably with any town of the same size in the country.

The inspection of the works occupied the time of the members until 5 o'clock, and subsequently, by the generosity of the Corporation, the members were entertained at tea.

Mr. Fraser (the Convenor of the Gas Committee) welcomed the members, and hoped they had spent an interesting afternoon at the works. Mr. D. D. Bruce (Leven), Vice-President, extended the thanks of the members to the Dunfermline Corporation, to Mr. Campbell, and to the President of the Association (Mr. W. A. Dearden), who is assistant to Mr. Campbell. Mr. Laing (Brechin) emphasized Mr. Bruce's remarks by thanking Mr. Campbell for the great interest he was taking in the affairs of the Association.

An informal meeting was held later, when an interesting discussion took place. Messrs. E. L. Farquhar (Edinburgh), Duncan and Thomson (Dundee), and J. J. Scott (Cowdenbeath) took a leading part. Mr. Dearden was able to give explicit information on the questions asked; and the novel arrangement for the meeting really accomplished its object by a number of the younger members taking part in the discussion. It is to be hoped that these members will continue to "make their presence felt" at future meetings.

Amsterdam International Gas Exhibition.

Mention has been made in the "JOURNAL" of the fact that an International Gas Exhibition is to be held in Amsterdam, from Oct. 13 to Nov. 11. It is intended to make the display as complete as possible; and copies of the rules and regulations, with application forms for ground space (which must be filled in and forwarded before May 7) are now available for those intending to exhibit. An influential Committee has been appointed, consisting of the following: Dr. L. J. Terneden, Director of the Municipal Gas-Works of Amsterdam (Chairman); Heer G. A. van Everdingen, Assistant-Director of the Municipal Gas-Works of Amsterdam; Heer O. S. Knottnerus, President of the Association of Dutch Gas Engineers; Heer J. Leonard Lang; Heer Ir. W. Niermeijer, Vice-President of the Association of Dutch Gas Engineers; Heer P. W. Scheltema Beduin; and Heer J. Diephuis Wzn., Chief Engineer, Municipal Gas-Works of Amsterdam (Secretary-Treasurer). All correspondence relating to the Exhibition should be addressed to the Secretary-Treasurer of the International Gas Exhibition, Amstel 1, Amsterdam.

The Cummer Portable Asphalt Plant.

The Cummer portable asphalt plant, as now being manufactured in England, is the outcome of 25 years' active experience in America. The plant is in three units—the dryer and mixer, the asphalt melting tank, and the engine—and each unit is separately mounted for easy transport. The sand and stone are lifted by a bucket elevator to the drying drum, which is specially designed to work at comparatively low temperatures. The revolving drum (internally ribbed to ensure a constant distribution of the material) is set at a slight incline over a furnace. Along the length of the drum are provided numerous air inlets; and a fan at the upper end draws the hot gases from the furnace through these and the end of the drum—thus bringing the material to be dried into direct contact with these gases. From the dryer the materials are elevated to a screen and storage bins, from which they are discharged through a weighing box to the mixer, where they meet the melted asphalt fed from the melting tank, which is of heavy section steel plate. An air pump and reservoir supply air for lifting the melted asphalt from the tank to the mixer through steam-jacketed pipes. The power transmission from the portable engine to the various parts of the plant is designed so that any portion may be put out of action without stopping the remainder. The Cummer asphalt plant (which can be supplied in stationary units if desired) is made in five sizes, varying from 4 tons to 20 tons per hour of sand.

FROM THE GASHOLDER TO THE HOUSEHOLDER.

A Few Notes on Distribution Topics from Brighton.

By Mr. P. E. BROWNE.

[A Paper read before the London and Southern District Junior Gas Association, Jan. 26.]

The importance of the distribution side of the gas industry has of recent years come to be fully recognized; and whereas until a comparatively short time ago it was an axiom that dividends were made or lost in the retort-house, and it was a fact that the exercise of extreme care in manufacture would bring its own virtuous reward by way of increased demand, nowadays, though it is still of first importance to manufacture gas of uniform good quality, this is not the whole of the problem. We now experience severe and sustained competition in the sale of gas for illuminating purposes, in which direction we formerly supplied practically the whole of our output; and competition—always healthy, so long as it is fair—has not only tended to revolutionize our lighting appliances, but has forced us to prospect and develop other fields to recoup our losses and ensure an ever progressing demand, without which we should first of all stagnate, and then commence treading the backward path.

It is here, then, that the functions of the distribution department lie—the marketing of our product. Much has been said and written on all sorts of questions concerning the selling end; and papers, which must be numbered as among the classics, descriptive of modern methods of sales organization, have been prepared by far more able exponents than the author of these few notes.

One's outlook must of necessity be somewhat restricted to the conception of the requirements of one's own particular area of supply as one sees them; and Brighton, although a large seaside town, and perhaps (if one may be allowed to say so) pre-eminent in the affections of the holiday-seeking public—at any rate, so far as the South Coast of England is concerned—is yet not so large, for instance, as Portsmouth, another seaside town, and its potentialities from a sales per consumer point of view may be, and probably are, entirely different. Therefore I would ask you to reflect that our problems are not necessarily your problems. But the principles involved and the ends in view in all gas undertakings run along fairly similar lines; and I have endeavoured to make a survey of some of the things that count in the work of getting our product over to the buyer.

BRIEF PARTICULARS OF THE BRIGHTON SUPPLY AREA.

First of all, I must burden you with something of our size and some particulars of our area, in order that you may envisage the district which we have to supply.

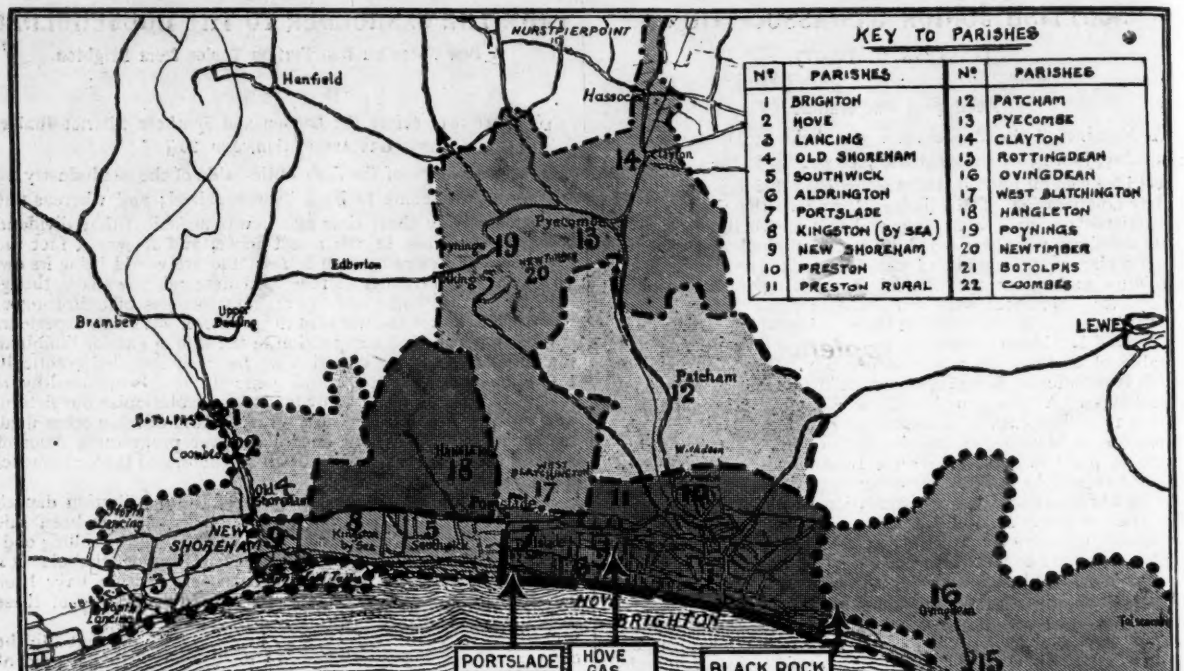
As known to a good many of your members who visited us last year for your summer meeting, our manufacturing works lie at Portslade-by-Sea, about 4 miles from the centre of the town. Our distributing stations are at Hove and Black Rock; the former about 1 mile north and 2 miles east, and the latter about 6 miles due east of the works. At both of these stations the gas is stored; the capacity at Hove being 2½ million c.ft., while that at Black Rock is just over 2 million c.ft. The whole of the gas made is exhauster driven to Hove by means of two trunk mains—one 24-in. and the other 16-in. From there the supply to the Black Rock holder station is controlled; a special 20-in. main traversing the whole distance from Hove by way of the sea front to an inlet receiver at Black Rock, from which the holders are filled.

The valve rooms at both stations are in telephonic communication, and practically the whole of the demand of the district east of the Hove station is supplied conjointly from both stations; the supply mains meeting in a large junction-box approximately halfway from either station, and situated opposite the Palace Pier on the Marine Front. The district west of the Hove station, extending to South Lancing at the Worthing Company's boundary about 1 mile from the town of Worthing, and comprising the parishes of Aldrington, Portslade, Fishersgate, Kingston, Shoreham, and Lancing, is independently supplied from Hove; the supply to the last four parishes being boosted at times of heavy demand by means of a Keith-Blackman narrow-gauge fan to an initial pressure difference of 12 in. Our eastern extremity—Rottingdean—is supplied by the Black Rock station direct through a separate 8-in. main, while a few years since an additional 8-in. trunk main from this station was laid to help the northern parts of our town (now thickly populated by people of the artizan type), in which we were experiencing some trouble with shortage of pressure at times of heavy demand. Our extreme width of coast line is between 13 and 14 miles, and the depth of area at present supplied about 2 miles, although this does not embrace several parishes over which we have powers, but no mains by reason of their present undevelopment.

Our annual output of gas is in the very near neighbourhood of 2000 million c.ft.—or, should I say, 10 million therms—and, indeed, we are hopeful that this year we shall reach this figure. This will place us, I believe, somewhere about twenty-fourth in size of undertakings in Great Britain and Ireland. Our consumers' meters number approximately 50,000; and we have 222 miles of mains.

DEALING WITH THE OUTER FRINGES.

Now this is leading-up to a question which is a very pregnant one with us at the moment—the question of storage capacity.



As just previously stated, our total storage is approximately 4 million c.ft. Now as our maximum day's output is 7½ millions, it would be said, I think, that we have a twelve-hour stock. This is all very well in theory, but does not work out in practice. By reason of the location of our holder stations, we cannot deliver to the district, by their agency alone, anything like this quantity of gas at an adequate pressure to serve the outer fringes; and, in addition, extreme care has to be exercised in order to prevent the holder pressure from Black Rock getting back to Hove. We find that on Sundays, during the cooking hours, from 11 to 1.30, when our hourly output in the summer reaches 750,000 c.ft., a good deal of careful valve manipulation is required, and we still are not able adequately to supply our extreme limits. Indeed, complaints of insufficient pressure in these localities, where developments due to municipal housing schemes and private enterprise have taken, and are rapidly taking, place, are becoming of such comparatively frequent occurrence that we are faced with the necessity to take some drastic steps to overcome the difficulty. There are, of course, alternative methods of cure—additional storage capacity on the one hand, and the laying of special high-pressure feeder mains on the other—and the particular circumstances of the case must decide which of these remedies is the more suitable.

You will remember that I spoke of the western district as being supplied with boosted gas. Well, our experience of the advantages of this system for specially dealing with the hours of heavy demand has been entirely satisfactory, and until we recently added the settlement known as Bungalow Town—comprising about 400 bungalows—it was perfectly sufficient for our needs. We are now displacing the booster of 65,000 c.ft. capacity, and replacing it with one of 250,000 c.ft. capacity, as the pressures are on the short side on Sundays, by reason of the fact that Bungalow Town is always very full at week-ends. We are confident that any difficulty will be eradicated by the larger machine; our arterial mains to the area being amply proportioned.

Our chief difficulty lies to the northern limits of the towns of Brighton and Hove; and we have decided that the best solution lies in the laying of a special feeder main carrying high-pressure gas, from which connections will be taken into our district trunk mains at the chief arteries from the town, at points approximately 1 mile from the centre of the town, the supply being suitably governed to throw an adequate pressure at these points. We are employing electric motor driven compressors of the rotary drum type by Messrs. Reavell & Co., Ltd.; the motors being specially wound to permit of variations of pressure within certain fairly wide limits. The requirement for which we have to cater being only of a comparatively few hours' duration on Saturdays and Sundays, and at times of holiday pressure, induced us to decide on this plant as being the most economical way of dealing with the situation.

We are laying the new main right round the district for a distance of approximately 6⅛ miles—from Hove holder station to Black Rock station—and are intending to compress from both ends. This will enable us to use either compressor singly or both together, as the demand warrants; while in the event of a breakdown either set might temporarily take the load. The arrangement also about halves the distance of compression, and consequently permits a greater ultimate delivery from either machine than would be the case if one machine had to drive the whole distance. Ability to compress to considerably greater degree than our proposed commencing pressure of 1 lb. will give a large margin for increasing demand; while in the event of our growing to the limit of output of the machines, duplicate units can be installed at either end to act as a stand-by.

While on the subject of compression, I would make the point that we are laying a main of comparatively large diameter (12-in.), in order to restrict the cost of compression. A predetermined delivery under high pressure may be obtained with a comparatively low initial pressure and large main diameter; whereas if a small main is laid, a disproportionately high initial pressure, involving the employment of a much greater horse power per unit volume, and a consequent greater cost per 1000 c.ft. for compression, is needed. For instance, in our case, we have gauged our initial required delivery at 75,000 c.ft. per hour, and this may be obtained by several alternatives—namely:

Approximate H.P. per 1000 C.Ft. for Compression.			
2·72	4-in. main.	Initial pressure	75 lbs. per sq. in.
1·57	6-in. main.	,, ,,	20 ,, ,,
0·55	8-in. main.	,, ,,	5 ,, ,,
0·25	12-in. main.	,, ,,	1 lb. ,,

The use of very high initial pressures also precludes the possibility of employing direct-driven sets such as we are installing. It may be of interest to state that the laying of this feeder main is well in hand, and every section as laid is being tested to a pressure of 30 lbs. per sq. in.

Some Present-Day Problems of Main and Service Laying.

While on the subject of mainlaying, I would like to touch briefly on the increasing cost of this branch of a distributory system in towns of any size, due to the new road construction methods now in vogue, in consequence of the increased weight of modern-day fast-running vehicular traffic. The tendency seems to point to the employment of wood block paved surfaces, with foundations of cement floated concrete, more and more as being the only class of construction that will stand-up to the work for any length of time; and the maintenance and repair of gas and other public utility mains and services in roadways of this nature becomes a serious question. Nowadays the road authorities are adding a further abomination in the shape of an expanded metal mesh laid in the concrete, for which is claimed a more equal distribution of the traffic load over the whole surface; and when it falls to our lot to have to locate an escape of gas in such roadways, I can conceive that serious happenings may occur before we are able to trace the source of the trouble, through our inability to break-up quickly the surface by reason of the homogeneity of the mass. At the same time, the expense that will accrue from the labour involved and the cost of re-instatement, will be out of all proportion to that ordinarily experienced.

To my mind, it is not justice to private enterprise to throw the onus of this upon gas and other public utility companies, nor yet the cost of overhauling and putting into repair mains and services in roadways about to be reconstructed. Such an undertaking means, in our case, the examination of every joint and the stripping of every service and its relaying in troughing and pitch, if there is to be any reasonable insurance against continual breaking-up of the new surface. The cost of this work surely should be aided by the Ministry of Transport, by whom it is understood the taxes obtained from commercial and private motor users were to be employed for new road construction, which surely includes such re-conditioning of our mains and service-pipes.

It is unfortunately not an answer in all cases to say "place the mains in the footways," as the heavy cost of two mains in each thoroughfare is prohibitive; and even if this were not the case, the sidewalks are to-day nearly always occupied already by electricity, telephone, or telegraph services whose jointing-pits or junction-boxes, as the case may be, make it almost impossible for any other service to find accommodation. The outlook is not a pleasant one to contemplate; and it seems to the writer that proper and adequate steps must be taken to bring this state of affairs—a growing menace—before the proper authorities, with a view to its amelioration.

The opening-up of new building estates to-day is not an unmixed blessing for gas undertakings, as the high costs of labour and material—though fortunately not now at the highest points reached—really prohibit free development of our service. We undoubtedly ought to be in the field immediately a new road is formed and sewered, but what of the cost? The new idea of very few houses to the acre, with long front gardens to each, is certainly more refreshing to the æsthetic sense than the long rows of semi-detached dwellings to which we have been accustomed; but it means that the profit likely to accrue from the sale of gas will be entirely swallowed up by the repayment of the interest on the capital expenditure necessary to furnish a supply. It is really a matter of extreme doubt, in the writer's mind, as to whether the cost of these mains will not actually become a perpetual charge on the undertaking.

At any rate, at the present time our practice is to require the estate owner or house owner, as the case may be, to reimburse a portion of the outlay on the new main or extension by way of yearly rental for a term of years; the payment being computed by us to provide 8 p.ct. per annum, to allow for interest on capital and maintenance. We further require, in the case of new services, payment for that portion beyond the statutory 30 ft. laid free on the public highway and the whole of the distance laid on the property requiring supply—*i.e.*, inside the boundary of the property. I do not know how far this agrees with the usual practice to-day, but I do believe that it is the only sound policy. In the days when labour and material were cheap—perhaps too cheap—one did not need to be over-nice in these matters; but now I am sure we cannot give anything away beyond what we are compelled to do by Statute—and this is bad enough. If our competitors feel constrained to do so, this is a matter for their decision; but I am of opinion that our service is worth selling. That is what we are here for. There is, I think, another aspect also—namely, that the acquisition of anything too easily tends to lack of appreciation; and in our case the free installations, so prevalent before the war period, induced customers to obtain appliances which were not sufficiently used to bring in a revenue commensurate with the installation cost.

The most profitable business to-day undoubtedly lies in the development of existing services—that is, by the placing of additional appliances in houses to which service-pipes are already laid; and the potentialities will be apparent if we take any street from our rental ledger, and note the varying consumptions accruing from houses of equivalent rental value and apparently similarly circumstanced owners. I admit that it is rough and ready, but it will give some idea of what is still to be accomplished by intensive canvassing. The lighting and cooking fields may be well harvested; but what of the domestic warming, water heating, washing-copper, smoothing-iron, &c., outlets?

Business Getting.

Let us now consider the selling end. At what are we aiming? I take it that what Mr. Oscar H. Fogg, the Secretary and Manager of the American Gas Association, called in his address to the Gas Sales Association of New England, as reported in the "Gas World" for June last, the "Goal of Uniform Maximum Load," is really what we have all got at the back of our minds, though perhaps we do not subscribe entirely to his tenets. At any rate, our problem is to sell to the consumer our output as regularly over the 24 hours as may be possible. Peak loads tax our producing and distributing plants severely, and are not profitable, in so far as exceptional means have to be devised and steps taken to supply the demand; and conversely "valleys" are not profitable, as there is often difficulty in storing the gas made, and in any case the overhead charges are practically constant whatever the output. It brings us therefore to the conclusion that the valleys want filling-in and the peaks restricting, as far as may be.

I venture to think that the peak load in most undertakings—with the exception, of course, of some notable cases—is that experienced during the hours of cooking; and as we are a conservative race, and can only take our meals at set times, and must cook on those days that other people do (which things have almost become the unwritten laws of life to us), it is difficult to see how we are to do other than go out to provide for these maximum demands. But the valley periods are very nearly always with us—in some cases more than others, of course—and they must necessarily vary according to the nature of the demand of the area supplied. In our case, we are not entirely devoid of manufactories; but they are conspicuously few, as becomes, I suppose, a town catering largely for visitors. We have, of course, a large number of hotels, restaurants, and boarding and apartment houses whose all-the-year-round demand (because we have visitors at all seasons) is very considerable; and we have also a large residential population, with its concomitant accompaniment of stores and sale emporiums necessary to support the national life. Our demand is rather domestic, therefore, than industrial—in fact, the former accounts for 96 p.ct. of our output.

Now I take it that, before we know how to set about increasing our output in the way most profitable to our individual undertaking, we must get some data to work upon—some idea of what we have to look for, and at what hours we are especially short of output, so that we may work towards the end in view. Lately in Brighton we have been keeping daily barometrical charts of output, so that we can compare similar days of the week throughout the year; and it is a very interesting study. So far our canvassing for business, I must at once admit, though in process of fairly methodical development in the days before the war, has since the war period progressed on somewhat hand-to-mouth lines. We have been in the fortunate, or the reverse, position (from whichever angle one prefers to regard it) of having plenty to do to deal with business immediately offering, and too busy with this class of new development business seriously to go out for what I may term extension business or development of the existing services.

It is our intention to get down to serious canvassing at the earliest moment, and to this end an index is being prepared of the various trades, businesses, professions, &c., pursued in our area, with the idea of concentrating on each in turn. In this connection, I may say we have a very large source of domestic heating as yet only just really commenced to be tapped, in the warming of guest rooms at our hotels; and from present indications, we are convinced that it will develop into an important load. The cleanliness of the gas-fire, the saving of labour and preservation of furnishing fabrics, the "ready-on-tap" service is making, and must make, a distinct appeal to the hotel proprietor in these days of servant difficulties.

Catering for the Customers' Needs.

We have been concentrating during the last twelve months or so on putting our house in order, first of all to be able to cater promptly for any class of business that may come along. Perhaps you will not altogether agree with me, but in my opinion our century-old industry has in some ways allowed itself to get rather unwieldy. The many ramifications of our business have tended to allow certain pre-conceived notions and habits to creep into our routine which have caused our customer to rather doubt the business capacity of our administration; and it is a fact that gas companies, as a rule, do not bear too good a name for expeditious execution of orders. We have to set ourselves to eradicate this impression once for all, because behind it in the consumer's mind is the feeling that gas is a monopoly, and that gas companies, knowing it, are prone to act in a dilatory manner toward their customers, and sometimes also with a *soupçon* of high-handedness. We most of us have met with this pre-conception at times, I expect, and therefore can appreciate how necessary it has become to do all in our power to get rid of any impediment that may foster such feelings. How are we to set about it? Well, I think in ordering our conduct of the business along the simplest lines compatible with the magnitude of our operations, and in co-ordinating all those sections of our outdoor departments in such a manner as to avoid over-running and duplication.

Avoidance of Over-Running.

To this end, in Brighton, we have recently fused all our outdoor sections into one whole, and have brought all our distribution clerical staff, hitherto working in separate sections and in separate offices, 2 miles apart, into one building at our head office. At this depôt we have also formed what (for want of a better term) I will call our retail store; our bulk or wholesale stores for cookers, fires, tubes, &c., being housed at Black Rock, where are situated the appliance repair and re-conditioning shops. As required, the storekeeper at the retail store requisitions on the bulk store for supplies, and all district requisitions are dealt with from the retail store at the head depôt; the storekeeper being in direct touch with the district, clerical, foremen, fitters, meter inspectors, and burner maintenance staffs.

Transport.

The deliveries of goods are all made from here; the six lorries and trade cars forming our distribution fleet being controlled by a transport clerk, who is, as will be seen later, responsible for the distributing and cartage of all stores necessary to the job when they are assembled for dispatch. You would be astonished at the little pin-pricks and large wastage of time that this officer has managed to get rid of, with ultimate satisfaction to the consumer and great advantage to the fitter actually carrying out the work, who, when he goes to a job, is now reasonably sure that he will not arrive to find that the material necessary is not delivered, and thus be constrained to drop his tools, or some part of them, at the customer's residence, promising to look back later—a

very sore point with the customer, as some of you may be aware. Removals are treated in a similar manner, with a corresponding accession of credit to the firm.

I have perhaps rather put the cart before the horse in speaking of district deliveries before we have dealt with the taking of the order; but it seemed part rather of the stores organization than the actual selling, so you must bear with me.

Our Methods in Brighton of Handling an Order (Illustrated with Lantern Slides).

Now we will consider the actual handling of an order from the time of receipt to the point of execution. From whatever source an order is obtained—be it from canvasser, showroom, complaint, or district office—it has, if it is a case of revenue work to be performed, to be the subject of an estimate of cost. Our experience is that "open orders" are frequently the subject of disputes when the account is rendered, while orders that proceed from properly specified estimates, from which consumers know exactly what is proposed to be done, and which bear a perforated acceptance portion for detachment and signature, seldom, if ever, occasion trouble.

Let us assume for this particular occasion that the customer is a new resident in our area of supply. The first requirement will be his completion of Form 1—Application for Supply; and if he desires to rent either a gas cooking or heating stove, he completes Form 2—Stove Hiring Contract. The detail of his requirements, with the addition of lighting fittings, or a desire for particulars of gas-heated water apparatus or other class of apparatus, is then entered on Form 3—Order Sheet. This order sheet proceeds to the appropriate district clerk (our area being divided into four districts), and this officer enters it on a numbered Form 4, called by us the "S.A.B." (Sales Account Book) Sheet, which bears a detachable slip, each district "S.A.B." sheet being of a distinctive colour.

The clerk then writes from this form an instruction in the district fittings foreman's book to call and prepare a requisition of material and labour required to carry out the work—Form 5. The original of this requisition is then returned to the office and priced, and from this the specification and estimate, with acceptance slip attached—Form 6—is typed and sent to the customer, its duplicate and triplicate being filed for reference; the requisition proceeding to the stores office for filing against the time of acceptance. Upon receipt of the signed acceptance slip, it is sent to the appropriate district clerk, who detaches the perforated slip from the "S.A.B." sheet and sends it to the stores office, where it is paired-up to the corresponding requisition and passed to the storekeeper, who assembles the goods for delivery. In the meantime, the application for gas form having passed through the rental office, after scrutiny for purposes of decision as to the terms of credit to which the customer's financial status entitles him, a Meter Order (Form 7) is issued, and sent to the meter department, by whom all particulars of the meter are entered on the card and the meter held ready for delivery.

When the assembling of the goods is complete, the storekeeper enters the Company's number of the cooking stove and fire on the "S.A.B." slip, stamps it "Assembled for delivery," sends it to the meter department, who issue a meter, stamping the slip "Meter issued for delivery," and in turn send the requisition to the transport clerk, who makes out the Van Delivery Sheet (Form 8) for the delivery of the goods at the earliest convenient time, and after dispatch stamps the "S.A.B." "Goods delivered," and passes it to the stores office. Here the address of the job and the Company's numbers of the stoves are taken, and entered in the stove-hire book, the completed "S.A.B." slip being sent back to the district clerk, who notifies the foreman that the goods are ready for fixing. The foreman then sends the fitter, inspects the job on completion, and answers it off in his job book. The district clerk completes the "S.A.B." sheet in the same way, and passes it to the stores office (where it is paired-up with the Detail Sheet, Form 9), sending it then to the accounts clerk, who writes the Account, Form 10, and makes an entry on the Summary of Accounts (Form 11) which proceeds to the rental department for collection. The stove-hire book entry of address and number is posted on to the Stove History Sheet (Form 12), and the meter order particulars are posted in the meter history book, and also in the quarterly meter book for rental charges. The stove-hire book also proceeds to the rental department for entry, for purposes of charge. It will be noted that the foreman's original requisition form is the basis of the transaction throughout.

Complaints are dealt with rather differently, as in the main they are not chargeable jobs. Upon receipt of a complaint, Complaint Order (Form 13) is made out in triplicate—the original (a flimsy sheet) being retained in book form, and the duplicate (a flimsy sheet) and the triplicate (a card) being sent to the district foreman, who gives the card to the complaint fitter for his order for the job and retains the flimsy in order to ensure the return of the card after remedy of the complaint. The fitter is authorized to carry our small jobs to private fittings and appliances, and may take payment for his services (a receipt book being furnished him), or he may obtain a signed order to charge; but in the main, as I have said, the complaints are small adjustments to hire appliances, and not chargeable.

Removals of the Company's hire apparatus are effected in somewhat similar manner to deliveries; a Removal Order (Form 14) being made out in triplicate. The original, a flimsy sheet, is retained in book form; the duplicate (a flimsy sheet) and the triplicate (a card) proceeding to the foreman, who hands the card to his fitter for the disconnection of the apparatus, and upon the return of the card sends it to the transport clerk, who enters particulars on his van sheet. The vanman delivers the returned appliances to our Black Rock works for cleaning and overhaul, and completes the card, which proceeds to the stores office. Here particulars are entered into the stove removal books, posted into the stove history and meter history books, and passed to the rental department—the card being filed in numerical order for retention.

I have endeavoured to describe, as concisely as is consistent with the amount of detail involved, the process of installation of a fixture at a consumer's premises; and now I would like to make the point that we must not leave it at installation only, as we have not by any means finished with our customer, having once secured him.

Maintenance.

He, like the poor, is ever with us, and has to be maintained—or, rather his installation has—in order to secure the continuance of his business. This is comparatively simple with regard to apparatus on hire. All hot-water appliances, whether of the circulating boiler or geyser type, are religiously examined at stated periods, and we also make a special point of examining and overhauling all hired gas steam radiators at the commencement of the heating season.

By reason of their very rapid growth, we cannot afford the staff necessary to examine each hired fire and cooking-stove every season; but, of course, we attend to each request for adjustment of such appliances, while we are prepared to clean thoroughly (on the consumer's premises) any cooking-stove which has been out on hire for a period of three years or more. We have a specially trained staff for this work, and have found that it effects a great saving to the Company, while giving complete satisfaction to the customer. The older method was, of course, the removal of the stove to the Company's works for overhaul, and the consequent requirement of a fresh cooker at the premises and the rehabilitating for stock of the stove removed. There is a big demand now in our town for gas-fires in hotel guest rooms; and in order that these may not prove a disfigurement to the apartment by reason of broken radiants or other dilapidations, we are specially examining all such fires during the summer months. The cost for labour averages 1s. per fire, but it is thought that the retention of the fire's clean and ever-ready appearance is well worth the outlay.

Lighting, heating, and cooking appliances sold for cash are not so easy to legislate for, as they cannot so readily be kept track of, and customers need a good deal of persuasion to induce them to allow us to make regular inspections, which would, of course, have to be charged for. It is recognized, however, that in the case of lighting fittings, the maintenance of the incandescent mantles and glassware in first-class condition is the keynote to the retention of the custom, and we have for many years past had a skilled burner maintenance staff as part of the sales organization. Even so, it must be admitted that we only supervise a very small percentage of the burners in use in our area, and this at a very considerable cost to the Company.

Realizing that many users of gas lighting are won-over to our opponent simply and solely on this question of maintenance, because it is so easy (though perhaps at the time distasteful) to purchase a new electric lamp when the old one is past praying for, while some effort is necessary to clean periodically the incandescent gas-burner and possibly renew a mantle, we have lately been concentrating on obtaining orders for burner maintenance. A salesman is specially detailed for the work, calling upon the consumer as the accredited agent of the Company, after due notification by letter. The results have been most gratifying. Quite a number of additional gas-consuming appliances have been placed, and many antiquated lighting installations have been modernized, and thereby saved to the Company, through his agency. If it were possible to obtain the supervision of every incandescent gas-burner on an undertaking's area of supply, I think that the progress of electricity for lighting would be considerably slower than is now the case. I leave the thought with you to devise some workable scheme to achieve this desideratum—the perpetual maintenance of every lighting appliance.

Re-conditioning of Apparatus.

Perhaps a few words on the re-conditioning of apparatus for hire when it has been returned to us from the district will not be out of place, as, of course, all our apparatus is re-issued many times over, and our consumer has the right to expect that when he places an order for an appliance it shall be in a condition equal to new.

Until just recently our cooking-stoves have, on arrival at the works, been stripped of all brass work, enamelled linings, and lagging, and then been immersed in caustic soda solution coppers to remove the grease. After removal from the copper, they have been drained off and then rubbed-down, repacked, clean linings and brass refitted, tested, and painted by hand for re-issue. The fires have been rubbed-down, repainted, and stoved in a coke-heated muffle. The process, however, is a lengthy one, and therefore costly; and it often happens that the busy season in either cooking or heating finds us working hand to mouth.

We have therefore just installed a sand-blasting chamber for the removal of the grease and paint after incineration in a coke-heated oven, into which the dirty cooking stove is placed complete with linings and lagging (being only stripped of its brass work).

The operation temperature of this oven is about 600° Fahr., and this has the effect of completely sterilizing the lagging and incinerating the grease. After sand blasting, the stove is painted and put into store for issue. We are about to instal a spray painting plant, both for cooking-stoves and fires; and we shall then hope to turn out the finished article with greater rapidity, and absolutely equal to new, although, in fairness to our cooking and fire shop staffs, it should be said that some excellent work is now done without these aids.

DISCUSSION.

The PRESIDENT (Mr. D. Cleave Cross) said they were indeed grateful to the author for the very valuable paper he had given them; and not the least attractive feature was the manner in which he had delivered it. Brighton had a live Gas Company. The consumption of gas had increased by at least 30 p.ct. since the beginning of the war—which for a big Company of this description meant something like 500 million c.ft. The Company's method of dealing with the "outer fringes" had interested him very much. There was great fascination in putting in a small main with high compression, because of the initial cost of the mains. At Brighton, however, they had put in a feeder main of fairly ample size, to keep the pressure down; and he considered this a very sound idea. His own Company had had to decide whether they should lay a large main, with a booster going just a few hours at the time of peak loads, or put in a small main with a big compressing plant. They decided on a 16-in. feeder main right to the other end; and after some eighteen months' experience, they were satisfied that this was the best policy. As to "valleys" and "peaks" in the load, and levelling-up, he had been very agreeably surprised in his own case to find that in the last two years the proportion of the day load (from 6 o'clock in the morning to 6 o'clock at night) to the night load (from 6 o'clock in the evening to 6 o'clock in the morning) had gone down slightly—1 p.ct. This showed that they were not losing the night load, but that, if anything, it was on the increase. One got quite an optimistic feeling from this reflection. Undoubtedly new roads presented a very serious problem; but he was afraid they must put up with it, though they should get something out of the Ministry of Transport if possible. There was one important point which all should bear in mind. Gas undertakings had been so busy with new work in their distribution departments that there might be some little danger of them having insufficient time to give good service to the customers already on the books. This must be guarded against. Once a consumer had been obtained, they must be as particular in keeping him satisfied as in securing new ones. He was sure they would like to hear a few words from Mr. Browne, senior.

Mr. A. F. BROWNE remarked that he felt greatly flattered by the kind suggestion made by the President; but as his life had been spent on the manufacturing side, he was certain that he could not discuss his son's paper to the edification of the meeting. It needed a very great man nowadays to have both manufacturing and distribution at his finger-ends.

Mr. J. R. GALE (North Middlesex Gas Company) referred to the complaint card, and asked whether, when it was completed and returned, it was filed away as a "dead" card, or was retained as a "live" one. If a man complained more than once, would there be a separate card for each complaint? With a card system, using a card for one house, with sufficient room for a number of complaints to be entered, was very valuable.

Mr. D. J. WINSLOW (Lea Bridge), alluding to the table of approximate horse power per 1000 c.ft. for various stages of compression, said he thought it was the first time this had been put on record, and it apparently put another "nail in the coffin" of very small pipes and very high pressures. He agreed with what was said in the paper as to new estates and the length of mains required. Certainly some help should be afforded them in this regard. Brighton, he saw, charged 8 p.ct. per annum, to allow for interest on capital and maintenance. Was this for a certain number of years? Perhaps when the consumption of gas got to a certain amount, they knocked this charge off? He had known cases in which, when the gas-rental was equal to 20 p.ct. of the total capital involved, the gas undertaking was willing to waive any claim for interest. Was the medium pressure main ordinary cast iron?

Mr. W. L. WESTBROOK (North Middlesex Gas Company) quoted the author's statement that "as the maximum day's output is 7½ millions, it would be said that we have a twelve-hour stock. This is all very well in theory, but does not work out in practice." Personally, he thought that, generally speaking, the great bulk of the consumption would fall between 7 and 9 o'clock in the morning, 11 a.m. and 2 p.m., and 5 and 8 o'clock in the evening. One of the most important parts of the paper was that relating to main roads and gas escapes. A main road had been laid in his own area with wood blocks and the reinforcement that Mr. Browne had alluded to. How on earth one was going to localize an escape in that, he did not know. The gas would get out where it could—probably following services and drains. In the case of such roads, the time seemed to him to be ripe for the provision of ducts in which to lay the mains. The laying of mains on both sides of the roads was very desirable where possible. It did away with services crossing the road; and the shorter services would be easier to clear. Who was responsible for the repair of service-pipes on private property, chargeable to the consumer when laid? If there was any escape afterwards, it was the company's loss. Was it legal to charge the consumer for keeping the service in repair?

Mr. G. H. LLOYD (Gas Light and Coke Company) particularly liked the canvassing scheme that was referred to for burner maintenance. The letter in advance was an ideal method. Companies should be out to maintain every burner in lighting.

Mr. J. G. CLARK (Gas Light and Coke Company) referred to the last part of the paper, where the author stated that he had two methods of reconditioning cooking-stoves, one wet and the other dry. Had the two processes been in operation sufficiently long to enable Mr. Browne to tell them something about the comparative advantages?

Mr. W. J. LIBERTY, on the subject of mainlaying and its cost, owing to the way in which roads are now made, pointed to the underground roads in the City of London. There, he said, the whole of the mains were laid side by side; and if the members would like to see how the services were taken off the mains and run into the houses at the various points, it would give him a great deal of pleasure to take them down one afternoon and show them this system of distribution.

Mr. H. W. KERRIDGE (Croydon) felt he must congratulate the author upon having three men on a van. A short time ago he himself applied for his cooker to be changed; and the Company in whose area he resided sent two men on a van. They took the old cooker out, put the new one in, tested it, and removed the old one, in a very short space of time. He considered this a commendable method.

Mr. A. BROADBENT (Gas Light and Coke Company) said he was interested in the question of supervision by the foreman. He understood that every job was inspected by the foreman. Not only did he make out the estimates of the material required for every revenue job, but also inspected every district job and every complaint job. Did the author consider that the cost of this was absolutely warranted in every case?

Mr. F. A. FROST (South Metropolitan Gas Company) remarked that, with regard to the main which was being laid on the outer fringe of the district, it was stated that gas could be boosted into that main from either or both ends as desired; but he did not mention how he proposed to introduce the gas from this high-pressure main into the subsidiary main. Was this going to be done by governors or by hand-control of numerous valves?

Mr. BROWNE, in the course of his reply to the points which had been raised, congratulated the President on the fact that his night load was increasing.

The PRESIDENT explained that two years ago the day load was 57 p.ct., and now it was 56 p.ct.

Mr. BROWNE added that his own domestic output was 96 p.ct. of the load, so that manufacturers were conspicuous by their absence. He had to legislate for his own particular area, and had plenty of valleys. His Company's plan had been to write a card as each complaint came in; but he thought Mr. Gale's idea was an improvement on this. They dealt with 51,000 complaints of all descriptions last year—a great many of them, of course, very minor ones—and he was inclined to think it would pay them to adopt the system of a separate card for each consumer. It was very important to get early information with regard to intended road repairs. He had always tried to get on with the officials of the corporations his Company had to deal with, and was very fortunate in being on good terms with them. The charge of 8 p.ct. per annum to allow for interest on capital and maintenance in connection with mains laid for the supply of new estates was for a period of ten years. The Company did not allow any consumption of gas to influence the amount of this charge. It used to be done; but the book-keeping involved became too complicated. The high-pressure main was of cast iron, with open lead joints. In connection with reinforced roads, he was intrigued with the suggestion that mains should be laid in ducts; but he was also intrigued with the cost. In the case of very wide roads, they did lay the mains on both sides; but at to-day's cost, this could not be done in all streets. He had been asked who was responsible in the event of an escape of gas from service-pipes on private property. The company were responsible from the tapping hole of the service in the main to the inlet of the meter. The company should never charge for an escape on the service; it was their gas until it reached the meter.

Mr. WESTBROOK: It is the legal aspect I want.

Mr. BROWNE: I am not a lawyer. Continuing, he said, as to whether he had any comparative costs of the wet and dry methods of reconditioning appliances, that they were using partially both at the moment; and he was sorry therefore that he was not in a position to give definite information on the point. The idea was to do away entirely with the caustic soda solution, so as not to use the wet process at all. It seemed to him that they were going to save a great deal of time, and he was not in the least afraid of not being able to do the work so well. He was convinced that it was a step in the right direction. They did not want to discharge workmen, but to be able to deal with the larger amount of work that was anticipated. Of course, subways were the ideal method of mainlaying; but, again, what was the cost? It could not be thought of to-day. Mr. Kerridge congratulated him on having three men to a van; but this, of course, was for heavy apparatus. There were also smaller vans, not so staffed, for taking out fittings or workmen. They did not supervise every complaint job by foreman. The foreman knew every complaint that was being dealt with, and in most cases would take the fitter's word, just selecting some check jobs. They must give the fitters a sense of responsibility or it was impossible to get good work out of them. The high-pressure gas was delivered into the district mains through Peebles type governors, which were being installed in each of the five governor-houses to be provided.

Southern Association of Gas Engineers and Managers (Eastern District).—The next meeting of the Eastern District of the Association will take place on Wednesday, Feb. 21, at 2.30, at the Institution of Gas Engineers, No. 28, Grosvenor Gardens, S.W.

Directory of British Chemical Manufacturers.—The publication of the new edition of the Official Directory of the Association of British Chemical Manufacturers for 1923 will be welcomed by all interested in the chemical industry, containing as it does a list of some 150 *bonâ fide* chemical manufacturers, with a classified list of the products which they manufacture, and including a section devoted to proprietary and trade names. The new list of products is in considerably more detail than in the previous edition; and, being translated into French, German, Italian, Spanish, and Portuguese, should be extremely useful to overseas buyers. The object of the publication is to facilitate business relations between manufacturers and chemical firms and purchasers all over the world. The Association will welcome inquiries with regard to any particular product. Copies of the directory may be purchased at a cost of 10s. 6d. from the offices of the Association at 166, Piccadilly, London, W. 1.

SOCIETY OF CHEMICAL INDUSTRY.

Some Aspects of the Fuel Problem.

An important meeting of the Birmingham and Midland Section of the Society of Chemical Industry was held on Tuesday, Jan. 23, at the University of Birmingham. The subject for discussion was "Some Aspects of the Fuel Problem," and Mr. E. V. EVANS, Chief Chemist to the South Metropolitan Gas Company, presided over a large attendance of industrial chemists, gas engineers, and members of the mechanical, electrical, and metallurgical societies of Birmingham and the Midlands.

THE CHAIRMAN'S REMARKS.

The CHAIRMAN, in opening, observed (speaking as a former Chairman of the Publications Committee of the Society of Chemical Industry) that the Committee always expected, and got, contributions of high standing from the Birmingham and Midland Section. They had become, perhaps, a little frivolous in the publication of their "Review;" but he hoped this would not detract from the dignity they used to give to their papers. The "Transactions" of the Society were a most important and stable part of their journal. It was an excellent idea to have created a "Fuel Symposium," in connection with which another meeting was to be held.

The gas industry was an old and well established one. In fact, they might say that it was a little too old and well established for the good of its soul—if industries had souls. By this, he meant that age and establishment sometimes did not lead to the rate of advance that was necessary. Electricity, which was a rival to that industry, was probably its best friend—a friend in disguise. It was very largely on account of this rivalry that some advances had been made in recent years. Birmingham had played a leading part in that advance; and the work which had been, and was being undertaken, by the Birmingham Gas Department was of the utmost value. He would like to take the opportunity of paying tribute to gas chemists who had been at Birmingham—Dr. W. B. Davidson and Dr. E. W. Smith—and to the present Chief Chemist, Mr. T. F. C. Rhead. The problems of the gas industry were as numerous as they ever were. The advantage of an industry possessing such products as coal tar and ammonia could not be overstated. The net revenue from the chemical products alone—tar and ammonia—constituted 15 to 20 p.ct. of the total cost of the coal into store. Whatever advantages might be claimed by the electrician for his appliances, there were many of them who thought electricity was always going to be costly until there was some improvement in the method of generating it. He knew perfectly well that he was on very delicate ground in Birmingham, which provided both gas and electricity; and he asked them to pardon him as an enthusiast. The psychologist might say his enthusiasm was due to the fact that the gas industry was more of a chemists' industry than was the electricity industry. He was sure they would agree that in the distillation of coal and the preparation of the bye-product coke there were many fields of development which promised immense advantages in the future.

Yesterday, coke was a residual; and it deserved to be called by that name. To-day they took the trouble to dry it, to keep it as free from ash as possible, and to grade it; and they had begun to look upon it as a serious bye-product. To-morrow, he believed that gas undertakings would manufacture not only gas, but also a smokeless solid fuel easily ignitable and containing little ash, which would in time supersede the use of raw coal in industry and in the home. When every ton of coal prior to use was treated at the town gas-works for the manufacture of gas and the elimination of smoky constituents—not necessarily by low-temperature carbonization—the scope of the gas industry would really be very much enlarged. The problems now surrounding the industry demanded the close collaboration of chemist and engineer; and if the rate of progress to-day were continued, the industry would undergo considerable change in the next few years. Finally, in his opinion, the time was fast coming when the distillation of coal would be acknowledged to be a true chemical process from beginning to end. Then the gas industry would take its place as one of the outstanding examples of applied chemistry, for the furtherance of which the Society of Chemical Industry was formed.

INVESTIGATIONS OF THE FUEL RESEARCH BOARD.

Dr. C. H. Lander, Deputy-Director of the Fuel Research Board, spoke at length on the investigations of that Board. His only regret was, he said, that Sir George Beilby could not be present, as he was abroad. The chemist, important as he was, must have sympathy with, and insight into, the point of view of the engineer and the physicist in dealing with broad fuel problems. Before utilizing the energy in the coal, it may be desirable to convert it into some other form of fuel (such as gas, coke, or oil), or into some other form of energy (such as electrical energy), the object being to increase the ease of transport, or of application, or both. Incidentally, it may be possible in the process of conversion to recover bye-products, some of which are available as fuel, while others are valuable for various purposes.

The programme of the Fuel Research Board, as laid down at its inception in 1917, followed two broad lines: (1) A survey and classification of the coal seams, in the various mining districts and by means of chemical and physical tests in the laboratory; and (2) an investigation of the practical problems which must be solved if any large proportion of the raw fuel at present burned in its natural state is to be replaced by the various forms of fuel obtainable from coal by carbonization and gasification processes. In regard to (1), the practical work in connection with the survey is being carried out by Local Committees. The first, in the Lancashire district, is now at work, correlating information concerning the most important seams in that district, and supplementing this by experimental work on sampling and analysis on a small scale. The points brought out by this survey have indicated the lines upon which work has been undertaken on a much larger scale, with a view to determining the processes to which the coal can best be submitted in order to obtain certain results. It may be interesting to note that experimental work, involving the gasification of more than 500 tons of this coal in vertical retorts, has recently been completed at H.M. Fuel Station. A group of firms, commercially interested, placed free of charge at the disposal of the Board some 300 tons of the seam, in order to assist the work. The Fuel Research Board came, he said, to the conclusion at a very early stage that, apart from investigation into the generally accepted methods of coal analysis, it was necessary to work-out some system for investigating the suitability of coal for low-temperature carbonization. A test was accordingly elaborated which, by direct weighing and measurement, gives the yields of gas, oil, water, and carbonaceous residue which result from carbonization at any definite temperature. A simple apparatus is so arranged that the progress of distillation can be watched from beginning to end.

The Board, Dr. Lander pointed out, finally recommended the thermal system of charging for gas as the only method by which it is possible to protect the consumer, and to afford to an industry using something like 20 million tons of coal per annum a freedom which would render it possible to select in each case those methods which would produce the most economical results, both from the point of view of coal economy and cheapness of gas to the consumer. That there is great scope for this development, is evident from the fact that, according to practice which has been well established in the past, only some 21 to 24 p.ct. of the total potential thermal units of the coal is sold in the form of gas. Whether it is actually desirable to increase this percentage in any particular case, depends upon local conditions, and upon the commercial value of the other products. The interdependence of the two lines of inquiry outlined in the programme of the Board was also emphasized by a variety of other influences during the past fifteen years. Among these have been the demand for cheaper and more ample supplies of electricity, home supplies of fuel oil for the navy, motor spirit and oil for transport and air services, and smokeless domestic fuel—the last-named having been brought about by the rapid growth of public opinion on the subject of smoke prevention.

The experimental work upon which were based the recommendations of the Fuel Research Board on Gas Standards naturally led to an inquiry as to certain proposed developments on the line of converting more of the potential heat units contained in coal into a good and saleable gas. The direction in which general practice was proceeding was the utilization of higher temperatures during carbonization, and the admixture of water gas made from a portion of the coke. The most recent step had been the method of introducing steam at the lower end of vertical retorts, and so converting some of the carbon into water gas within the retort itself. This method was, in fact, a resuscitation of work carried out by Sir George Beilby during his association with the Scottish shale industry in the early eighties, and had recently come into prominence on account of the valuable test work which had been carried out by Mr. Blundell, Mr. West, and others. Small percentages only of steam had, however, been used by the experimenters, since their aim had obviously been to keep the carbonic acid in the gas under 4 p.ct. Accordingly, early in 1918, an order was placed for the installation at H.M. Fuel Research Station of a setting of four retorts capable of carbonizing 10 tons of coal daily, which were designed and erected by West's Gas Improvement Company, Ltd.; but certain modifications were introduced to render possible the obtaining of experimental results with the highest degree of accuracy. The results obtained by the Fuel Research Board were in the main details in agreement with those of Uddingston.

Work has also been in progress at the Station during the past summer on the manufacture of water gas; and upon this a report will shortly be published. "I may so far anticipate this by saying that the main results," added Dr. Lander, "are that with a normal water-gas plant it is possible to obtain a slightly greater thermal efficiency by working on the Dellwik system, where a thin fuel bed is used, with a blow to CO_2, but that in a normal plant this gain in thermal efficiency is obtained at the expense of the output. If a plant were specially designed to obtain this higher thermal efficiency, it would require greater floor area for the same output. Hence it is not necessarily commercially economical." In addition, work has been going on by the Research Board simultaneously in connection with low-temperature carbonization; and this Dr. Lander proceeded to describe. Finally, he dealt with the subject of power alcohol.

A paper was presented by Dr. A. Parker, F.I.C., on "The Thermal Efficiencies of Production of Different Grades of Gases." Pressure on our columns necessitates the holding-over of this until

our next issue; but we give below the short general discussion which concluded the day's business.

DISCUSSION.

Mr. LAMB (Institution of Mechanical Engineers) urged that one was bound to have due regard for the remarkable increase in the output of oil during the last seven years. The output in coal was practically stagnant; and it was desirable that they should concentrate upon the subject of coal bye-products.

Prof. MORGAN (University of Birmingham) said he would like to see it made a penal offence for persons to burn raw coal in their grates at home; but if defective gas equipment were supplied, the penalties might have to be imposed upon those responsible for so sending them out. It was unfortunate that a set-back, due to the poisoning cases in London, had occurred. It would be a great pity if the practice of using gas-fires were hindered.

Mr. FORREST (Birmingham Electric Supply Department) put in a plea on behalf of electricity, pointing to the use that could be made of water power, and also to the employment of slack in the generation of current.

Dr. ED. B. MAXTED (Chairman of the Birmingham and Midland Section of the Society of Chemical Industry) commented upon the large amount of heat that was going to waste in blue water-gas plant. In connection with the utilization of coal, too great importance could not be placed on the aspect of the bye-products obtained. Many branches of the chemical industry depended entirely upon coal bye-products. These were not usually obtained when the coal was burned directly under boilers for the generation of steam, though he had seen designs for boilers in which the tar was recovered directly.

Mr. F. R. O'SHAUGHNESSY (Tame and Rea Drainage Board) referred to the fact that an engine was being driven on sewer gas at those works. It was an interesting practical experiment, the economic results of which were being closely watched.

The prospects of the oil-shale industry in this country formed the subject of an inquiry by Dr. MONKHOUSE; and Mr. CARTER (Birmingham University) asked if it were worth while to pay more attention to the lignite deposits in Devonshire.

Dr. LANDER and Dr. PARKER briefly replied. As to oil shale, the sulphur difficulty was a serious one. There was little lignite in this country.

On Feb. 6, Mr. E. C. Evans, Mr. R. E. Keeling, and Dr. E. W. Smith will make contributions to the "Symposium of Fuel."

Dr. Waldo on CO Dangers.

Dr. F. J. Waldo, J.P. (the City of London Coroner), at a recent inquest, in connection with a case of carbon monoxide poisoning, referred to the dangers of this gas. He stated that coal gas was easily recognized by its peculiar odour, even in small quantity. Experiment, however, had shown that such gas after slowly percolating through some 6 to 7 ft. of earth, might become almost odourless, while, at the same time, gaining an increased percentage of carbon monoxide. For economic reasons, he doubted if anything could, or would, be done to prevent the poisonous amount of carbon monoxide at present found in common use in connection with coal gas. What he had constantly advocated for upwards of 21 years as a Coroner, and before this as a Medical Officer of Health, was the granting of legal powers to the various gas companies to inspect and test, and see that all household fittings and appliances were kept in a reasonably fit and safe condition. Also that the gas companies be given every possible opportunity and encouragement to examine their street-mains—especially in poor, congested, and heavy traffic-ridden streets. Dr. Waldo added that not only was carbon monoxide in coal gas an agent of acute chronic poisoning, but it also acted as an insidious cumulative chronic poison. Slight leakages of gas, as well as the use of flueless gas-heaters, of flueless geysers, and of old-fashioned water-slide gaseliers, and of flueless gas cooking-stoves, were a fruitful source of chronic poisoning by carbon monoxide. He had been a victim of the flueless gas (so-called) radiators in one of his Courts. Flueless gas-heaters with bunsen burners gave off sulphur, carbonic acid, water vapour, and carbon monoxide—all injurious to those who inhaled such irritating and poisonous vapours.

Fire Caused by an Electric Wire.—There was lately an outbreak of fire from an unusual cause in a warehouse at Oldham. A live electric wire came into contact with a pipe leading to the gas-meter, with the result that a hole was burned into the pipe and the gas ignited. Fortunately the damage done was only slight.

Split Gas-Pipe Causes Death.—In the case of a Hackney widow, 80 years of age, who was found dead from gas poisoning, it was stated by Mr. G. H. Lloyd (of the Gas Light and Coke Company) that the tube of the gas-bracket was cracked, the join in the seam having been eaten away by oxidation of the metal. Modern brackets, he pointed out, are usually made of drawn tubing. The bracket was between 15 and 20 years old. If wiped over occasionally with an oily rag, oxidation of the metal at the joint of such fittings would not occur. Tenants should ask for fittings to be examined if old, or if they noticed anything suspicious.

Smoke Abatement League to be Revived.—At a private meeting in Manchester, held with the object of reviving the Smoke Abatement League of Great Britain, it was unanimously decided to restore the activities of the League, dormant during the war, and to take such active part as is possible in influencing the Government Bill, which, in the form it had taken in the late Parliament, was on the whole considered a reactionary measure. A Council was formed; and a memorandum was sent to the Government viewing with alarm the introduction of the limiting words, "as far as practicable," into the forthcoming Bill, as a general statement. Those who wish to join the League can do so by sending a minimum subscription of 2s. 6d. to the Acting Hon. Secretary, Mr. C. Elliott, 33, Blackfriars Street, Manchester.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Works Capacity at Leeds.

SIR,—With reference to the paragraph in your issue of the 24th inst. [p. 223] headed "Vertical Retorts at Leeds," in which it is stated that the total capacity of the Leeds Gas-Works is 14 million c.ft. per day, I would point out that this is not correct, as the figure quoted only represents the coal-gas plant. In addition to this we have water-gas plant to the extent of 5½ million c.ft. per day, also a supply of coke-oven gas up to 1 million c.ft. per day, making a total works capacity of 20½ million c ft. per day.

In other respects the information given was correct.

Leeds Corporation Gas Department, Jan. 27, 1923. C. S. SHAPLEY, Engineer and General Manager.

Gas By Gallons and Puncheons.

SIR,—I enclose an extract from an account of Hamilton Parish, written in 1835, showing that, amid all the criticism nowadays of selling gas by therms instead of cubic feet, the people of Hamilton 88 years ago reckoned their gas charges by gallons and puncheons.

Gas Offices, Motherwell, Jan. 26, 1923. T. ORR.

[ENCLOSURE.]

EXTRACT FROM THE STATISTICAL ACCOUNT OF HAMILTON PARISH, 1835.

GAS-WORK.—A gas-work, on a very elegant plan, was erected in Hamilton by subscription, in the summer of 1831, at the expense of £2400. Three hundred £10 shares were subscribed, of which £8 only has been uplifted; and from the advance in the price of such shares as have been transferred, there is a fair prospect of the subscribers being liberally remunerated for their outlay. From experiments made at this work by Mr. Burns, the present Manager, it appears that a cubic foot of the richest cannel coal produces about 400 c.ft. of gas.

The price of gas when sold by meter is 10s. per 1000 c.ft., or 1s. per 100 c.ft. Every cubic foot is nearly equal to 5 imperial gallons. Of course, 500 imperial gallons only cost 1s., which is at the rate of about 3d. per puncheon. Beside private lights, there are now about 130 gas-lamps illuminated throughout the town for nine months in the year, from sunset to sunrise, with the exception of five nights at each full moon.

The Fleetwood Accident.

SIR,—There is issued with every plant a small book of instructions for working the Tully gasification plant. On page 4 the following instructions are given:

"*Wash-Box.*—When working, the water supply must be kept constantly running.

"The box must be thoroughly cleaned once a fortnight immediately after a day's work, while the pitch is soft and easily removed. The up-run valve may require cleaning oftener with some coals, as the pitchy tar runs down the pipe on to the valve in the wash-box, preventing it closing properly. Care should be taken to close the valve on the outlet of the wash-box before opening it up, and the stack-valve just sufficient to draw away the gas from the coking door, and apply a light before opening, as is done in the case of ordinary retorts. It is advisable to keep a little steam flowing into the box when opened up for cleaning, and on no account must a naked light be used, as should the outlet-valve be leaking an explosion or gassing is liable to occur."

"*Scrubber.*—Will probably go for twelve months or more without any attention whatever, but should it be necessary to remove the scrubber doors for periodical inspections, it is advisable to blow steam into scrubber before removing doors, and keep an atmosphere of steam in scrubber when cleaning. Care must be taken to ensure that all valves are closed. The idea of admitting steam is to fill the place caused by the vacuum created when the scrubber is cooling down. When cleaning valve between scrubber and wash-box these precautions are also advisable."

It really should not be necessary to offer such instructions to a practical gas engineer. If workmen will run the risk of using naked lights, they are asking for trouble. It is extraordinary how careless men are until they actually have an explosion, which as a rule gives them such a scare that it is not likely to happen again. The gas plant, such as station meters, washers, or scrubbers, should never be opened up for cleaning without first filling them with steam and keeping the steam on until the doors are removed. "Safety first" is a good motto, but one that is not sufficiently emphasized in gas-works.

Newark-on-Trent, Jan. 29, 1923. C. B. TULLY.

Dysynni Gas Company's Charges.—It has been reported to the Towyn and Aberdovey Urban Council that the Dysynni Gas Company have given notice of their intention to apply to the Board of Trade to alter their Provisional Order by substituting the maximum charge of 8s. 4d. per 1000 c.ft. for one of 2s. 11½d. per therm. The Clerk said this was about 20 p.ct. above the present price. The Council decided to lodge an objection.

A New Gas Supply for Gargrave.—Skipton Urban District Council have decided to apply to the Board of Trade for an Order authorizing them to supply gas to Gargrave, and including that township within the Council's "limits of supply." This action follows a recent ratepayers' meeting at Gargrave, which decided unanimously to urge Skipton to supply gas. Gas hitherto has been furnished from a private undertaking in connection with a mill and mansion estate, but was discontinued some time ago owing to the cost being greater than the yield.

REGISTER OF PATENTS.

Lighting Controller.—No. 185,427.

COMPAGNIE POUR LA FABRICATION DES COMPTEURS ET MATÉRIEL D'USINES À GAZ, and MILLET, L. C., both of Paris.

No. 23,870; Sept. 2, 1922.

(Patent of Addition to No. 180,547 of May 11, 1921.)

This invention relates to lighting and extinguishing devices for gas-burners and the like, and is a modification of the invention described in patent No. 180,547 [see "JOURNAL," Vol. CLVIII., p. 39], having for its object an application of the latter to enable the apparatus to perform the simultaneous lighting and the extinction of several burners or groups of burners.

For this purpose the apparatus modified according to the present invention comprises, instead of the single distributor of the principal patent, which opens or closes the orifices of admission of the gas to the burner and to the pilot, two distributors corresponding to two different burners or groups of burners. Besides, the mechanism operating the distributor of the principal patent has been replaced by two controlling mechanisms, each of which corresponds to a distributor and works by itself for the extinction of the burners, but which are actuated one by the other and operate jointly at the moment of lighting the burners, and inversely.

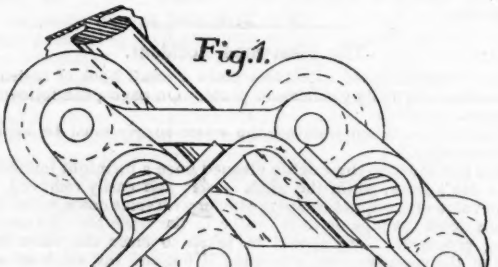
Guide Rollers.—No. 190,639.

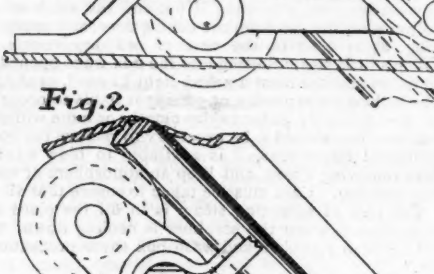
DEMPSTER, R. & J., BEARD, G. F. H., and SCOTT, J. W., all of Manchester.

No. 34,471.; Dec. 22, 1921.

This invention relates to the guide rollers of spirally-guided gas-holders, and has for its object to provide means to couple together the axles on reverse sides of the guide rails, so that the whole of a carriage is utilized to take the strain for preventing undesirable displacement.

According to part of an invention described in specification No. 20,568 of 1911, pairs or sets of rollers are provided on each side of a guide rail, each pair or set being capable of movement about a central or common axis, and coming into operative contact with the guide rail according to the rise or fall of the holder.





Messrs. R. & J. Dempster's Improved Roller Carriage.

The present invention is illustrated by fig. 1, which shows in sectional elevation pairs of rollers on a tank side or outer lift of a gas-holder, and fig. 2 is a view similar to fig. 1, but without the present improvements applied thereto, and illustrating a possible and undesirable displacement.

In fig. 3, one of the rollers is shown displaced or forced away from the head of the rail, which, partly by reason of the amount of play between rollers and guide rail and want of freedom of movement about the axis under excessive conditions of weather, becomes possible. The effect of this may be to cause actual disengagement between roller and rail, or, alternatively, a jambing action on the companion roller on the same yoke.

To remedy this, cross links or the like are introduced as shown in fig. 1. These links engage the axles, and it will be seen that any outwardly moving tendency on the part of a roller will thus be transmitted to a corresponding roller axle on the opposite side, and so bring the latter into engagement with the guide, assuming it was not already engaged therewith. Thus the defect of fig. 3 will be overcome, and also rollers on both sides of a guide rail may invariably be in operative contact with the same, irrespective of whether the holder is rising or falling.

In some cases, flexible members such as chains may be employed in place of links, and in any case the links or connections need not pass directly to the roller axles—for example, they may be pivoted on the extreme parts of, or extensions from, the carriage.

Dry Meters.—No. 190,634.

MURRELL, W. A., of Nottingham.

No. 33,782; Dec. 15, 1921.

No. 20,447; July 26, 1922.

The object of this invention is to provide a dry meter which will give a more uniform pressure of gas at the outlet and a greater measuring capacity for the same cubical dimensions, and in which the connecting joint between each of the leather diaphragms and the casing shall be sufficiently strong and rigid to withstand the strain of the frequent reversals of curvature of the leathers, and shall be made without soldering near the leather.

For the usual fixed central dividing plate is substituted a movable diaphragm or piston, one embodiment of which is a central dividing diaphragm consisting of a disc with a flexible ring joint of leather connected to the inside of the casing by a fixed annular ring and flexible leather suspension strops. The two outer diaphragms are connected to the inside of the meter casing by similar flexible ring joints of leather; and in all three cases the connection between the leather and the casing is a corrugated annular joint consisting of a fixed ring made of tinned iron and of J or U section, and of a loose ring of similar section to interlink with it after the leather diaphragm has been put into position. This is done by curving the edge of the leather into double corrugated ogee shape, placing the outermost corrugation into the hollow of the fixed ring and the innermost corrugation into the hollow of the loose ring, interlinking the two rings, and then closing them both upon the leather. Thus a strong and rigid gas-tight joint is quickly formed after all soldered joints near the leather have been made.

When the gas enters one of the inner measuring compartments, the central diaphragm is forcibly extended by the gas pressure into the space normally allotted to the other compartment; thus accommodating within the first compartment a larger volume of gas than is allowed by a fixed central plate. This extension proceeds alternately by successive reversals of the curvature of the diaphragm, to each side of and beyond the centre line of the casing; making a central portion of the casing common to each of the measuring compartments, but at different times. The charge of gas in each compartment is expelled therefrom by the pressure of gas in the other compartment reversing the curvature of the central diaphragm, similar pressure in the space between the meter case and the outer diaphragm forcing the latter inwardly towards the central diaphragm.

The use of the aforesaid flexible central diaphragm instead of a fixed central plate provides a resilient partition between the two compartments, and so equalizes the pressure and eliminates objectionable fluctuations of gas at the burners.

Gas-Burners.—No. 190,752.

COBB, J. W., of Buffalo, N.Y.

No. 22,267; Aug. 22, 1921.

This invention has particular relation to burners of the kind in which the air and gas first enter a tube or chamber in which primary mixing takes place, and then pass to another chamber, which may be termed a secondary mixing chamber, in order that the elements of the mixture may be thoroughly commingled before combustion takes place. Provision is made for simultaneously controlling the flow of the mixture from the primary to the secondary mixing chamber and from the latter to the combustion zone, in such a manner that on increasing or decreasing the flow from the primary to the secondary mixing chamber, the flow from the latter to the combustion zone will also be increased or decreased.

The claims show that provision is made for supplying additional air as the mixture leaves the secondary mixing chamber; such being by means of a surrounding jacket communicating with the atmosphere at a point diametrically opposite the secondary mixing chamber outlet. Simultaneously with the mixing-chamber flow control, the primary air is regulated, while the gas supply is independent. The valve, however, will move the flow control means as the gas supply is being closed.

Rotary Retort Apparatus.—No. 190,819.

HUTCHINS, T. W. S., of Northwich.

No. 26,023; Oct. 1, 1921.

This invention relates to apparatus for the distillation of coal, oil shale, &c., of the rotary type, which is externally heated to effect low-temperature distillation. The object of the invention is to provide improved means for preventing the caking of the material being distilled and the adhesion of the material or of the distillate volatile matter to the walls of the retort.

The patentee claims for the provision of one or more tumblers which may extend from end to end or through any desired portion of the length of the tube, each tumbler comprising radial arms upon which the tumbler can rest, and each being adapted to be carried round the inner surface of the tube as the latter rotates until it overbalances and strikes the tube.

Regarding the retort, the patentee employs two concentric tubes, into the inner one of which the material to be distilled is fed and from the outer one of which the solid residue is discharged; the feed and discharge means and the gas off-take all being situated at one end of the plant.

To allow of end play in the retort and to obviate a rigid joint, there is provided a flexible diaphragm carrying a jointing ring which bears against the end of the tube or retort or a collar rotating therewith.

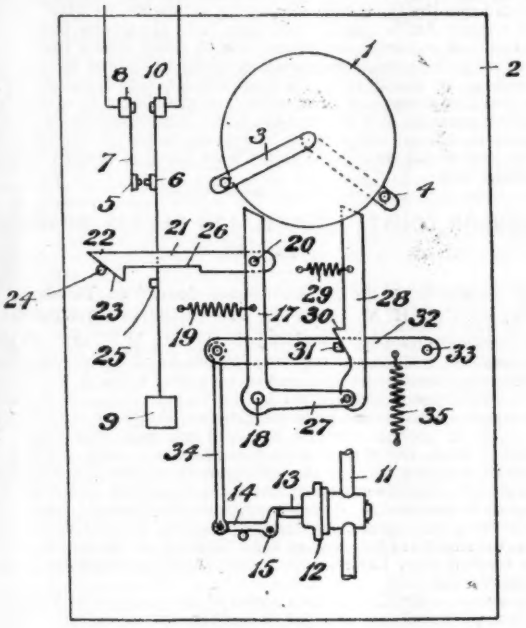
Igniting Mechanism.—No. 190,812.

GRASEBY, R. C., of Westminster.

No. 25,868; Sept. 30, 1921.

This invention relates to mechanism for effecting electrically the ignition of gas burners and the like, of the type in which the ignition circuit is normally open and is arranged to be intermittently closed by a vibrating spring arm for a certain interval from the time at which the gas-supply valve is opened, in order to enable the supply of gas to the burner to be fully established and the air expelled from the pipe. The invention has for its object to provide a simple and effective mechanism, cheap to manufacture, and reliable in operation.

The operation of the device is described as follows in connection with the drawing.



Graseby's Automatic Lighter.

Assuming that the parts are in the position shown, and the actuating arm 3 of the clock mechanism 1 is brought into engagement with the upper extremity of the bell-crank lever 17, the continued movement of 3 in a counter-clockwise direction will effect the rotation of 17 about its point of support, in opposition to the action of the spring 19. The lever 21 will consequently be moved to the right, disengaging itself from the projection 24 and engaging with the projection 25 on the flexible element of the pendulum 9. This movement of 17, acting through its short arm 27, will simultaneously effect the downward movement of the lever 28, until the projection 30 thereon engages with the underside of the projection 31 formed on, or attached to, the lever 32. At this stage the pendulum 9 is held by the lever 21 in one of its extreme positions.

When the actuating arm 3 arrives at a position in which it is clear of the upper extremity of 17, this lever will return to its position under the action of the spring 19, and the inclined face 23 of the enlarged head or projection 22 of the lever 21 engaging with the stop 24, the lever 21 will be moved out of engagement with 25, and the pendulum 9 will commence a series of oscillations effecting a continuous make and break between the contacts 5 and 6, and a consequent continual opening and closing of the ignition circuit, until the oscillations of the pendulum have become reduced in amplitude to a predetermined extent.

Furthermore the return of 17 to its normal position effects the quick upward movement of the lever 28; and the projection 30 thereon being in engagement with the projection 31 on the lever 32, this lever is rotated about its point of support, thereby raising the lever 34 and permitting the free passage of gas to the burner. The pendulum 9 in these circumstances will continue to oscillate for an interval of time sufficient to establish the free flow of gas through the burner, the lighting of the burner being insured by this intermittent opening and closing of the ignition circuit, which continues until the oscillations of the pendulum have been reduced to within very narrow limits, dependent upon the adjustment of the contacts 5 and 6.

The cutting-off of the gas supply is effected by means of the actuating arm 4 of the clock movement, which engages with the upper extremity of the lever 28, moving the same in a clockwise direction against the action of the spring 29, until the projection 30 is disengaged from the projection 31 of the lever 32, when the latter, under the action of the spring 35 and acting through the levers 34 and 14, permits the gas valve to close.

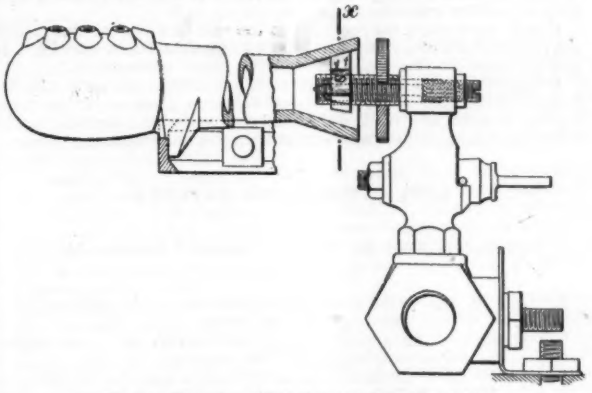
Mounting Atmospheric Gas-Burners.—No. 190,874.

VULCAN STOVE CO., LTD., and FRICKER, E. H., both of Exeter.

No. 30,779; Nov. 18, 1921.

This invention relates to means for mounting atmospheric gas-burners in fires, cookers, and the like, more particularly the type of burner comprising two main parts—namely, the burner member proper, having a mixing tube or chamber, and a separate injector or nipple whereby the gas is injected into the open end of the mixing tube. The object of the invention is to provide improved means for mounting the burner member, and also for correctly positioning the open end of the mixing tube relatively to the injector.

Reference to the part-sectional side elevation, which is reproduced, will show how these objects are attained in one form.



Burner Mounting—The Vulcan Stove Co., Ltd.

To fit the burner member in position the flared open end of the mixing tube of the burner is passed over the end of the injector, so that the shouldered portion of the projection on the underside of the burner member rests within the recess in the bracket. A radial armed collar is then screwed towards the outer end of the gas nipple until the ends of the arms fit closely against the inner walls of the internally cone-shaped end of the mixing tube, thus forcing the projection under the burner body firmly against the inner side of the bracket, and so holding the burner member securely in position. The flared mouth of the mixing tube of the burner is at the same time held by the radial arm of the collar concentric with the gas nipple. The collar may be locked in position by a set-screw.

The air enters the mixing tube between the radial arms of the collar, and is adapted to be regulated by means of a disc screwed along the nipple.

Instead of a radial armed collar being employed, as above described, the flared end of the mixing tube may be supported by a disc arranged to screw upon the gas nipple and engage with the inner wall of the flared end, and provided with air inlet holes.

Furnace Cover.—No. 190,935.

JAMES KEITH AND BLACKMAN COMPANY, LTD., and KEITH, G., of Farringdon Avenue, E.C. 4.

No. 3083; Feb. 2, 1922.

This invention relates particularly to a cover for furnaces for metallurgical purposes, of the type connected to the body of the furnace by parallel links so as to be readily movable to one side without friction or rubbing. The cover which is the subject of this invention is adjustable in relation to a frame to which the links are pivoted.

In practice the cover proper is in the form of a square brick surrounded by a metal frame or band arranged to grip the brick—as, for example, by means of bolts uniting the ends of the segments of the band. The band is fitted with four projecting pins, two on each side of two opposite sides, to which pins are attached links. The lower ends of the latter are hinged on pins projecting laterally from the body or structure of the furnace; the pins on the body being spaced apart the same distance as the pins on the band. A link on one side may be connected above the cover proper to the corresponding link on the other side—for example, these two links may be in one piece, the upper or connecting portion being in the form of a half hoop, presenting a handle.

When the handle is actuated, the cover will perform an orbital movement after the fashion of an element of a parallel ruler—*i.e.*, will be bodily lifted from the structure of the furnace and bodily lowered without any friction or rubbing on the top of the furnace. The brick is adjustable in relation to the top of the furnace body by slackening the bolts, permitting the brick to settle on the body, and then retightening the bolts.

Gas-Tight Door for Furnaces, Retorts, &c. No. 190,919.

GEORGE, S. E., of Kidderminster.

No. 107; Jan. 3, 1922

This invention relates to a gas-tight door for furnaces, retorts, and the like, particularly to self-fitting doors of the type in which the door is pivoted to the frame by a swinging link to allow it a limited movement in a direction at right angles to the plane containing the door opening; means being provided for applying pressure to the door in that direction to cause it to seat tightly against the frame.

The patentee maintains that the various forms of mechanism proposed for doors of this type have not been successful in practice, largely on account of the fact that they are complicated and expensive to produce. His object is to provide a door which is extremely simple in action but effective in use, and which may be produced at a comparatively small cost; and his invention essentially comprises a door which is supported upon its frame by a double hinge or hinges, and has provided at or near the centre a bar member of length greater than the depth or breadth of the door, the ends of the bar being adapted to

engage the inner faces of brackets carried on opposite sides of the door frame, and being chamfered off so that as they ride along the inner faces of the brackets, pressure is applied to the door to force it tightly against the frame.

A machined seating is provided on the inner face of the door and co-operates with a corresponding seating on the inner frame; and asbestos or other suitable packing may be provided, if desired, retained by a groove in either seating.

One or more stops are provided on the rear face of the outer edge of the intermediate hinge member, which engage the frame and limit to a small angle the rotation of the member about its hinge-pin.

Where the door is of substantial size, horizontal projecting ribs are formed on the door above and below the centre pivot as a fulcrum for the bar between its pivot and the brackets; and raised portions may be provided at each end of these ribs to limit the movement of the bar.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for Jan. 24.]

Nos. 1234 to 1881.

APPLEBY, E. G.—"Gas producers, retorts, &c." No. 1802.
BENTLEY, G. H.—See Appleby. No. 1802.
BIK, C. M.—"Closing mechanism for fluid pipes, &c." No. 1652.
BRADY, J.—"Pipe plug or joint." No. 1850.
DAVIES, W. E.—"Carbonization of coal, lignite, &c." No. 1641.
DAVIES, W. E.—"Carbonization and/or gasification of fuels." No. 1646.
DRAKE, J. W., and DRAKES, LTD.—"Charging and discharging apparatus for gas-retorts." No. 1842.
EASTON, R. W.—"Retort." No. 1870.
FEUERHEERD, E.—"Combustion of gas in bunsen burners." No. 1560.
HALL, I.—"Valves for control of gases or liquids." No. 1527.
HOWLETT, J. H.—See Hall. No. 1527.
M'INDOE, R. W.—"Prepayment gas-meters." No. 1600.
MAHIEU, P.—"Gas-heated cooking or heating devices." No. 1479.
MITCHELL, A. J.—"Stands for gas-rings, &c." No. 1420.
TAUNTON, R. P.—See M'Indoe. No. 1600.

RESTORATION OF LAPSED PATENT.

An order has been made restoring letters patent No. 1645 of 1911, granted to ALEXANDRE FOLLIET-MIEUSSET, for "Improvements in or relating to the introduction of gas and secondary air into gas-furnaces."

MISCELLANEOUS NEWS.

GAS REGULATION ACT APPLICATIONS.

The following further notices have appeared in the "London Gazette" with regard to applications to the Board of Trade under the Gas Regulation Act.

DECLARATIONS OF CALORIFIC POWER.

Ashton-in-Makerfield Urban District Council.—475 B.Th.U. (March 12.)

Borough of Beaumaris.—500 B.Th.U. (April 1.)

Garw and Ogmore Gas Company.—425 B.Th.U. (March 31.)

Solihull Gas Company.—500 B.Th.U., in substitution for 475 B.Th.U. (April 30.)

METROPOLITAN GAS COMPANIES' OFFICIAL TESTINGS.

The reports of the Gas Referees for the past quarter of the official testings under the provisions of the Gas Regulation Act give the following average calorific values for the gas supplied by the Metropolitan Companies named.

Brentford Gas Company.—464·6 B.Th.U. (declared calorific value, 460 B.Th.U.).

Commercial Gas Company.—488·4 B.Th.U. (declared calorific value, 475 B.Th.U.).

Gas Light and Coke Company.—504·4 B.Th.U. (declared calorific value, 500 B.Th.U.).

South Suburban Gas Company.—481·3 B.Th.U. (declared calorific value, 460 B.Th.U.).

Wandsworth, Wimbledon, and Epsom District Gas Company.—489·5 B.Th.U. (declared calorific value, 470 B.Th.U.).

West Riding Gas Inquiry.—Mr. A. W. Brightmore, Inspector to the Ministry of Health, held a public inquiry at Bolton-on-Dearne last Thursday, into an application by the Wath, Bolton, and Thurnscoe Gas Board for sanction to a loan of £30,000 for the extension of their undertaking. The Accountant to the Gas Board (Mr. J. L. Hawksworth) said the application had been rendered necessary by the rapid development of the area supplied. Of the £30,000 asked for, £21,000 was required for the provision of mains, services, and fittings in connection with housing schemes. Then £4000 was the estimated cost of extensions to the purifying plant; and they needed money also for street lighting. In 1910, two years after the Board was formed, the gas produced was 50 million c.ft.; and this had increased to 115 millions last year. The loans already sanctioned totalled £135,670, of which £10,522 had been repaid. No opposition was offered to the application.

METER RENTS IN THE CITY OF LONDON.

Charge to Continue.

It will be remembered that occupiers of City property were considerably perturbed last autumn on hearing that, in seeming defiance of an Act of Parliament, Gas Companies were to charge meter rents. This was an impost from which the citizens had been free for 70 years. In fact, meter rents had never been charged in the City. The publicity given to the matter in the City Press resulted in action by the Corporation. Negotiations were immediately set on foot with the Gas Companies—the Corporation claiming freedom from the rent on behalf of the ratepayers and occupiers of the City. As a result of a conference, it was agreed that the Companies and the Corporation should each take Counsel's opinion.

The matter was thoroughly threshed out, and it has been practically decided that the Companies are acting within their rights. Though the original Act is specific, and later Acts apparently intended the privilege to continue, the clauses are so badly drawn that Counsel feel that nothing would be gained by taking the matter to the Courts. Moreover, on investigation, the Committee, having examined the case for the Companies, are of opinion that the charge is equitable. In the circumstances, it is felt that the Companies should be permitted to impose the charge, and that the citizens are better off by paying them than they would be if legal action were taken in support of a very doubtful case.

LONDON COUNTY COUNCIL AND CARBON MONOXIDE IN GAS.

At the Meeting of the London County Council on Tuesday of last week, Mr. Cyril H. M. Jacobs (the Vice-Chairman of the Public Control Committee), replying to Mr. J. D. Gilbert, M.P., said his attention had been called to an inquest at Whitechapel the previous week, when strong remarks were alleged to have been made by the Coroner.

No official test was prescribed by the Gas Statutes, he remarked; but tests for information purposes disclosed the proportion of carbon monoxide in London gas. No standard had been prescribed. The Board of Trade Departmental Committee in 1921, after hearing considerable evidence, came to the conclusion that it was not necessary or desirable to prescribe any limitation of the proportion which might be supplied in gas used for domestic purposes, but that the departments concerned should carefully watch the situation, so that Parliament's attention might, if necessary, be again directed to the matter, should such freedom from limitation be accompanied by unexpectedly unfavourable results.

Reference to the Committee's report of April 4 last would show that for January and February, 1922, the proportion of carbon monoxide in the gas supplied by three Companies was as follows: Gas Light and Coke, 15·8 p.ct.; Commercial, 12·5 p.ct.; South Metropolitan, 7·6 p.ct.

Battersea Borough Council and the Question.

The Health Committee reported to last week's meeting of the Battersea Borough Council that they had received a statement from the Medical Officer of Health relative to a case of gas poisoning which occurred to a man, his wife, and child, residing at No. 134, Leathwaite Road, on Dec. 12 last, caused by an escape from a leaky gas-main in the roadway outside the house in Burland Road. The Medical Officer said that he had investigated the matter, and had sent a report of the case to the Ministry of Health and the Board of Trade. It appeared that the gas percolated from a fractured main in Burland Road, about 44 ft. from where the service-pipe entered the house.

In view of the fact that the presence of carbon monoxide, which was permitted by law to be added to coal gas, gave rise to narcotic poisoning, the Committee thought it desirable that greater precautions should be taken to prevent the gas escaping into dwelling-houses, and recommended: "That the attention of the Ministry of Health and the London County Council be called to the case, and that they be informed that, if it is not possible to eliminate the poisonous element, an obligation should be placed upon the gas companies to take greater precautions to ensure that the supply pipes and fittings are in such a condition that no accident can arise."

Gas Developments in Derbyshire.—Important developments in connection with the gas supply are now taking place in the Eckington and Killamarsh districts of Derbyshire. The Eckington and the Killamarsh Gas Companies have so far made all the gas required in the area. Messrs. J. & G. Wells, Ltd., are under the new scheme to supply gas from their collieries at Holbrook to the two Companies. The quantity to be taken by them will amount to 48 million c.ft. per annum.

The Deficit at Keighley.—Though, as already stated in the "JOURNAL," yielding a gross profit of £5576, the Keighley Corporation gas undertaking, according to the financial statement submitted to the Council, experienced a net loss of £896 in the year ended June 30 last. Despite this position, the Gas Committee recommended the Council to transfer £7060 from working capital account, and £6063 to relief of the general district rate—being the estimated cost of public lighting—and to donate £100 to the local hospital. The Chairman of the Committee (Mr. W. H. Murgatroyd) said it was a long time since the department had had a deficit; but though the receipts for gas were higher by £2500 than in the previous year, the abnormal drop in the prices of residuals had upset their estimates. Coal had cost £9491 less, and wages £2645 less; while, on the other hand, the cost of maintenance and repairs at the works had increased from £3478 to £8488, and of maintenance and repairs to mains and services from £3432 to £4607—a total increase of £6185. They had, in addition, paid £1614 in wages to provide work for men sent from the Distress Committee. Having in mind the depreciation in residuals, the unusual expenditure in repairs, and the fact that Keighley gas was cheap, it was maintained that the deficit of £896 could not be taken as a serious matter.

THE THERM INQUIRY.

Fifth Day—Final Public Sitting.

Friday, January 26.

The fifth meeting of the Committee appointed by the Board of Trade to inquire into the method of charging for gas on the therm basis, was held at the Institution of Mechanical Engineers, Storey's Gate, Westminster, on Friday of last week. (The previous proceedings were reported in the "JOURNAL" for Dec. 20 and 27, pp. 743 and 804, Jan. 17, p. 146, and last week, p. 213.)

The Chairman of the Committee is Sir CLARENDON G. HYDE; the other members being Mr. ARTHUR BALFOUR, J.P., Sir JAMES MARTIN, J.P., Mr. W. J. U. WOOLCOCK, C.B.E., and Mr. A. PUGH.

When the proceedings opened,

The CHAIRMAN said that Mr. Goodchild (of the London, Midland, and Scottish Railway Company) whose evidence was reported in the "JOURNAL" for Jan. 17, pp. 147-8, had sent to the Committee two charts with reference to pressure. Tests were taken simultaneously at the inlet and outlet side of a governor fixed in some tenement buildings belonging to the Midland Railway in the St. Pancras area. They showed that at the inlet the pressure varied from something like 32-10ths to well over 45-10ths, while at the outlet, on the house side of the governor, the pressure registered was nearly constant at about 20-10ths.

The Committee had received a letter from the British Association of Chemists, which body claimed to have a voice on the question of the appointment of gas examiners.

A letter (in reply to the Committee's circular) had also been received from the Walthamstow Urban District Council, whose district is served by the Lea Bridge Gas Company, in which it was stated that they were not in a position to give evidence. Further, the Council had stated that it was not the therm which had caused the trouble. Complaint was made as to the price of gas, and the fact that burners had not been replaced. The Company were called upon to do this. The large opening of the burner allowed too much gas, in proportion to air, to pass through, resulting in decreased efficiency.

With regard to the evidence given by Mrs. Feltham [see "JOURNAL" for Jan. 24, p. 215], the Gas Light and Coke Company had looked into the matter, and had written a letter to the Committee. The inspector who had made inquiries had been able to convince Mrs. Feltham that the new method of charge made no difference whatever to the price and the amount of gas used. No escape had been detected, and the lady was continuing to use gas.

The Committee had also received a letter from the Metropolitan Borough of Finsbury, saying that they had a representation to make to the Committee. Meanwhile, a letter had appeared in the "Daily Mail" of Jan. 26, to which the Chairman referred. It stated that the therm disguises the high price of gas; "better value for money" is an ill-founded suggestion; independent tests of fittings should be conducted; and conditions of gas-testing should be altered. The Council had no knowledge of any adjustments of fittings being made in Finsbury by the Gas Light and Coke Company (who serve the district) such as the law said should be made (free of charge). The Council asked for a revision of the standard price of gas (which concerned both gas charges and dividends), as that price was fixed when wages and costs were at their highest. They suggested that the price should be adjusted automatically as the cost-of-living index figures altered, and also that provision for the independent testing of fittings, to ensure their safety and efficiency in burning the gas supplied, should be made. "In regard to the large percentage of deadly carbon monoxide in gas to-day," the letter continued, "recent deaths due to the accidental inhalations of the new form of gas are the cause of grave anxiety in this borough, owing to the uncertainty of consumers detecting by smell gas capable of producing fatal results. Immediate steps should be taken to remove this grave risk."

EVIDENCE FROM SIDCUP.

Councillor F. H. VALLANCEY (Sidcup Urban District Council) then gave evidence on behalf of the ratepayers of Sidcup. He said that from official reports it was assumed that the therm quality was practically constant, and that street and other incandescent burners were set accordingly for a constant volume of gas and air in order to get a regular mixture. Pressure, however, varied according to high or low levels, and also between times of maximum and minimum demand. The Sidcup District Council had no objection to the therm in principle, but to the method of application. He suggested that a governor should be provided by the gas company on the consumer's side of every meter, so that pressure variations between the high and low parts of the districts served, and during times of maximum and minimum demands, should be obviated. It appeared that uniform adjustment of incandescent burners was impossible with the present quality and pressure supplied, the air passages having to be adjusted three or four times during the course of the day. The witness was furnished with particulars of a case in which the registered consumption by a Sidcup resident in the June quarter of 1922 was considerably greater than that of the June quarter of 1921; but the Chairman said that witness could not put forward a case unless he was in a position to vouch for the facts.

Dealing with the matter from the point of view of a private consumer, witness said he had an office in Farringdon Street, E.C., where gas was supplied by the Gas Light and Coke Company. He pleaded guilty to having practically opened the correspondence in the "Daily Mail" on the subject of therm charges. He gave evidence purely as an amateur, and he stated that, after issuing instructions to the staff to practise the strictest economy, his gas bills had continued to rise considerably. The bill for the June quarter of 1922 was considerably more than three times the amount of the bill for the corresponding quarter of 1921. After the third or fourth visit of the inspector a private hint was given to him that all taps should be readjusted; after that there was a big fall in the amount of gas consumed. He believed that the therm system of charge was excellent, but considered the apparatus supplied by the Company to be hopelessly out-of-date for the present quality and pressure of gas supplied. Consumers as a whole seemed to be justified in their opinion that companies should previously have warned them to adjust their apparatus, before allowing them to waste what would appear to be a considerable proportion of the gas supplied.

THE VIEWS OF LEATHERHEAD.

Councillor H. V. ROE (Leatherhead Urban District Council) complained that, under cover of the fog created by the cheap-looking therm, the Leatherhead Gas Company had raised their standard price higher than the public realized. He did not complain of the therm as such; in fact, selling gas by quality was an ideal method. He complained of the increased standard price, which enabled the Company to pay a higher dividend.

The Chairman pointed out that application could be made to the Board of Trade to revise the standard price; but witness said he did not know this. The Chairman also alluded to the provision in the Gas Regulation Act which enabled gas undertakers to apply to have their post-war standard raised in proportion to the proved increase of the cost of production, and upon this the price was arrived at, without reference to the therm.

Continuing, witness referred to a letter which had been written by the Secretary of the Leatherhead Gas Company to the "Leatherhead Advertiser," in which he had mentioned that, owing to increased costs during the war, the price of gas had increased, but that under the therm system it had come down. He (witness) had written a letter to the paper pointing out that the Secretary, although correct, had given rather a wrong impression, because under war conditions the price had gone up only 6d., but after peace was declared it had gone up by 2s. 6d. It was probably right that the price should be raised less during the war than afterwards; but the Secretary of the Gas Company was rather wrong in suggesting that under the therm system the price had been reduced. He agreed with selling gas on quality; but why complicate the matter by selling by therms?

The CHAIRMAN, examining a gas bill handed in by witness, said the bill was in cubic feet, and was also worked-out in therms. What more did witness want?

WITNESS said the Gas Company were open to error in converting cubic feet to therms.

The CHAIRMAN said the witness apparently wanted the relative price per 1000 c.ft. as well as the price per therm.

WITNESS reiterated that it would be better to sell by cubic feet.

After the Chairman had pointed out that the Committee could not over-ride the Act of Parliament, witness said he had hoped that the Committee would recommend that the basis of charge for gas should revert to the old method; but, as at present, the gas companies should guarantee the thermal quality of the gas.

The CHAIRMAN said that, as a matter of fact, witness had that in his bill; there was the number of cubic feet, the number of therms, and the price per therm. The only other information the company could possibly give would be the price worked-out per 1000 c.ft.

Replying to Mr. WOOLCOCK, who put questions with regard to the suggestion that the Gas Company should charge per cubic foot, but should guarantee a particular standard, witness said that gas companies were enabled to use their bye-products far more profitably when selling by the therm.

Mr. WOOLCOCK remarked that they need not bother about that. If he had to pay for gas per cubic foot, and the thermal quality of the gas was guaranteed, how was he to overcome a tendency on the part of the gas company to supply gas of a very low thermal value? If the gas company decided to fix a standard of 300 B.Th.U., he would be absolutely in their hands. Would he have to say what thermal value he wanted?

WITNESS replied that the gas company declared the value of the gas supplied.

Mr. WOOLCOCK pointed out that each gas company declared the thermal value of the gas supplied by them.

WITNESS said if the thermal value decreased the price per cubic foot would be lower. Continuing, he said the Council at Leatherhead did not understand the therm. The standard price had increased from 4s. 2d. to an equivalent of 7s. Electricity was supplied in Leatherhead; but he did not think they understood that any better. At the same time, it was considered that the price of electricity should come down.

Therefore, said Mr. WOOLCOCK, the point was that, whether it be electricity or gas, the price was too high, and in the case of gas it had nothing to do with the therm.

WITNESS was certain that, when the new price was fixed, if the Council had known that it represented 7s. per 1000 c.ft., they would have objected more strongly than they had done.

At this point the CHAIRMAN stated that he had had a letter from Mr. Burton (Managing-Director of the Bishop's Stortford, Harlow, and Epping Gas and Electricity Company and of other companies) who desired to say that in respect of these companies, which were all working under the thermal system, and had been for some time, practically no objection to the system had been received.

THE SMALL CONSUMERS OF WEST HAM.

Councillor W. J. RUMSEY (West Ham Corporation), speaking on behalf of the small consumers, said they realized that they were being robbed; and under the new system they were paying about half as much more for their gas. He was dealing with prepayment meter consumers, of which there were thousands in his district. The gas was of no better quality. The working man's wife, who used to place (say) 4d. in the slot-meter in order to cook the Sunday dinner, now had to put in 6d.; and the dinner took just as long to cook. His district was supplied by the Gas Light and Coke Company, and the price had gone up during the last nine or twelve months. Lately the gas was worse than it was a few months back, in the sense that more pennies were required. He was a night worker. Often a penny was put into the slot at night in order that he could cook his breakfast in the morning; but when he wanted to light the gas at 6 o'clock in the morning

there was no gas—the penny absolutely disappeared. This was not the case a year ago.

The CHAIRMAN asked Mr. F. W. Goodenough (Gas Light and Coke Company) whether the pressure had varied at 6 o'clock in the morning between now and a year ago; and he replied that it had not.

WITNESS said that, being a representative of the workers on the Council, people came to him with their grievances. He had hundreds of complaints; the chief argument of the general body of the working class being that the cost of production of gas had come down, and yet they had to pay more for their gas. Labour and coal costs had decreased. Recently in his house the gas went out, and a penny was put in the slot. Only one gas-jet was burning, and in twenty minutes it went down again. Months ago he usually got two hours' light for a penny. He had had his meter inspected, and was told that it was all right. He did not make any complaint regarding the thermal system. About twelve months ago, when the meter was cleared it usually contained 17s. or 18s., and he was repaid about 9d. Now the amount was from 29s. to 35s., and he was repaid about 4s. or 5s. The money returned was not in proportion to the extra amount put in.

Mr. GOODENOUGH said the gas consumed, as registered by witness's meter for the 354 days ended January, 1922, was 23,320 c.ft., and for the 364 days ending January this year the consumption was 22,500. The gas consumed in the latter period was less than in the previous period; and as the price of gas was lower in the latter period than in the former, his gas had cost him less than a year ago. The price per 1000 c.ft. was 6s. 4d., as against 5s. 6d. to the ordinary consumer, in 1921. The price went down to 5s. 11½d. for the first two quarters of 1922, 5s. 5d. for the September quarter, and 5s. for the December quarter. The present price was 5s., which included the extra 10d. Witness could not possibly have been paying more money than before. The gas was now supplied at 500 B.Th.U., as against 475 B.Th.U., and the pressure in the district was good.

Mr. STEPHEN LACEY (Distributing Engineer to the Company) said that the pressure in that part of the Company's district was about 4 in. from 5 a.m. practically right through the day. Conceivably the trouble was the mechanism of the meter, and the complaint certainly had nothing to do with pressure.

Mr. GOODENOUGH promised the Chairman that he would go into the history of the meter and the actual cash paid over a period.

The CHAIRMAN said that a special investigation would be made of witness's meter, and that this particular meter would be taken as a test case for the consumers of West Ham.

Mr. D. C. CROSS (Assistant Engineer to the Lea Bridge Gas Company) referred to the letter received from Walthamstow, and said the price of gas supplied by the Company was now 11d. per therm. At Michaelmas, 1921, it was 14d., and every quarter since then the price had come down. There was every likelihood of its being still lower. As to the readjustment of burners, the Company had supplied the same quality of gas for seven years; the present standard being 450. Before the war the standard was 14½ candles, and a spot test taken then showed the gas to be of 500 B.Th.U. Last year the gas was 456, and the worst during the war period was 426. When the Company received a complaint, it was seen to at once, and if the apparatus required changing, this was done. There was not an abnormal number of complaints recently. The consumers did not object to the therm. The number of cubic feet as well as of therms was stated on the accounts. There was a uniform pressure of 4 in. all round the district.

Mr. J. W. EVANS (of No. 59, Cartwright Gardens, W.C. 1) said he was supplied by the Gas Light and Coke Company on the prepayment system. There were two meters in the house—one for the bedrooms, and one for the kitchen. He considered that the fluctuation in gas quality under the therm was so considerable, that it was not wise to charge by that basis only. The gas supplied to him varied in pressure and quality. He suggested that a method should be adopted which would encourage the consumer to be economical, and encourage the gas companies to supply good gas as cheaply as possible. He had been connected with the gas industry for 23 years before the war. He handed to the Committee a letter which he had sent to the "Daily Mail," but which was not published. In this he had said that Prof. Boys' suggestion to stick a label on each meter stating the number of therms per 1000 c.ft. was the best commercial method of educating the public on the therm question.

With regard to the relation of the sliding-scale to the therm system of charging, witness considered that the attached values and prices below the basic rates should be encouraged as a reward to shareholders for supplying cheaper gas:

Quality. B.Th.U.	Value. Therms per 1000 C.Ft.	Therm Price.	Price per 1000 C.Ft.	Half-Yearly Dividend.	—
		d.	s. d.	Per Cent.	
150	1½	4	0 6	..	
200	2	5	0 10	10	Charge per 1000 c.ft. for use of fittings on slot meters 10d.
250	2·5	6	1 3	9	
300	3	7	1 9	8	
350	3·5	8	2 4	7	
400	4	9	3 0	6	
450	4·5	10	3 9	5	
500	5 (basic)	10	4 2	5	
550	5·5	9½	4 4	5	
600	6	9	4 6	7½	Charge per therm for use of fittings on slot meters 2d.
650	6·5	8½	4 7	7½	
700	7	8	4 8	8	
750	7·5	8	5 0	8	
800	8	7	4 8	10	
850	8·5	7	5 0	10	
900	9	6	4 6	12½	
950	9·5	6	4 9	12½	
1000	10	5	4 2	20	

The basic price being governed by the cost of fuels at current London Gas Companies' contract payments for the purchase of coal and oil, any rise or fall in the expenditure on these two items should act *pro rata*.

EVIDENCE BY THE GAS COMPANIES' PROTECTION ASSOCIATION.

Mr. R. W. EDWARDS (Vice-Chairman of the Association, a member of the Executive Board of the National Gas Council, and Chairman and Managing-Director of the Aldershot Gas, Water, and District Lighting Company), stated that it could be fairly said that the Association was representative of the interests of gas companies, and was officially recognized as such. The demand for the present inquiry had come upon the members as a great surprise, because they were not aware that there was any general dissatisfaction with the therm as a basis of charge, or even with the charges, that would justify this further unsettlement of the industry. Gas companies, after the series of disturbing influences which they had had to encounter in the last few years, had hoped, on the passing of the Gas Regulation Act, that they were in sight of something like stabilized conditions.

Dealing with the Aldershot Company, witness said that the district of supply extended over 150 square miles. The Company supplied a number of townships besides Aldershot, as well as military camps, with gas, water, and electricity. The only complaint arising out of the Press agitation came from one of the smaller towns some distance from Aldershot, and was over the signatures of ten consumers. The Company's Engineer and Accountant had met the consumers concerned. It was found that in two cases the cause of the increase was that the meters had been registering slow previously; in another the meter was the consumer's property, and he did not think the increased consumption was of sufficient importance to have it tested; in two others there were very small increases; and in the remaining five cases the accounts were lower than for the corresponding previous period. He believed the consumers were all satisfied after the conference.

The views of the members of the Association had been obtained particularly on the following points:

1. Adjustment of burners.
2. Complaints—
   (*a*) since commencement of charging by therms;
   (*b*) after Press agitation.
3. Whether any increase above the normal rate of consumption since commencement of charging by therms.
4. What steps were taken to assist the consumer to understand the therm system.

With regard to adjustment of burners, witness found that generally, where the company, on the first declaration, declared a quality corresponding to that which they were previously supplying, no adjustment was made; but in one or two cases where there might possibly have been some doubt as to the pre-therm value, the company, to be on the safe side, had adjusted the consumers' apparatus where necessary. In all cases of a second declaration, the companies adjusted the consumers' burners.

As to complaints, in a large number of cases there were none. Considering all the circumstances, this was remarkable testimony as to the smoothness with which companies of varying degrees of importance—some purely country, some large towns like Cardiff and Swansea—introduced the new conditions. As regards those who did receive complaints, witness's information was that there were no more complaints than usual up to the time of the Press agitation, but a few since. In three cases complaints were made after the Press agitation, but before the change to the therm was made. Since the introduction of the therm, the price of gas had come down throughout the Association.

With regard to No. 3, there had been no such increase in consumption as would justify the idea that the companies were profiting in some mysterious manner by increasing the consumption under the therm. Where there had been an appreciable increase above the normal rate, it could be accounted for by some exceptional circumstances—such, for instance, as in the case of the Brentwood Company, where some large institutions became consumers. On the other hand, a considerable number of companies showed decreases; but it would be no more right to attribute these decreases to the introduction of the therm than it would be to jump to the conclusion that in the case of an increase it was the result of some "wangling" by the companies.

Regarding the steps taken by the various companies to explain the nature of the change to the therm, witness had found that the particular explanatory leaflet (Bristol's) which appeared to commend itself to the Committee, was by no means exceptional in its informativeness—in fact, in most cases careful steps were taken to effect the change in a way calculated to disarm hostility by the consumers and to educate them in the matter, which no doubt explained the comparative absence of complaints in the provinces. He handed in a few forms of circulars, &c., issued by companies on the first institution of the therm. In most cases the consumers generally knew of the intended change, because the intention of a company to apply for a therm Order had to be advertised in the local newspaper; and in cases where the application was opposed by the local authority, that fact was also known. The consumers, therefore, could safely be said to have been somewhat prepared for the alteration. There had been some attempt to educate the consumers by giving information on the accounts; but he believed the general practice had been to educate the consumer apart from the account.

Mr. EDWARDS had prepared evidence with regard to the suggested revision of standard prices, pointing out that the members of the Association felt that revision in the near future would be premature, that it would be unfair to the companies and damaging to the interests of the consumers, and that he considered the therm prices had not been working sufficiently long to justify revision at present. The Committee, however, did not take evidence on this point; it being pointed out by the Chairman that they were not concerned with revision, and would make no recommendation about it.

Replying to Mr. WOOLCOCK's suggestion that it was thought the therm could be introduced without the gas companies doing much to inform the public, witness said that, on the contrary, he realized that the companies had done a great deal to educate the public. He was surprised that there should be any general dissatisfaction after the trouble that had been taken. With regard to steps being taken to instruct the public before the therm was actually introduced, he explained that individual companies could not very well commence to educate the consumers about therms until they received their Orders

under the Gas Regulation Act. It would have been premature. But when they had obtained their Orders, they had done their best.

Mr. WOOLCOCK took it that it would be the business of the Association to look ahead on behalf of their members; and he asked whether the Association had in fact done anything to educate the public, apart from what individual members might have done, when the therm was introduced.

Mr. EDWARDS said they had not; but he outlined the functions of the Association, as well as those of the "B.C.G.A." The latter body did a great deal in preparing for the introduction of the therm. The industry looked largely to the "B.C.G.A." for the education of the public.

Asked whether any one of the pamphlets he had handed in could be taken as a model to explain to the public what the therm really meant, witness said he would pick out one which had been used by his own Company. He referred to that specially because it was a pamphlet drawn up by the "B.C.G.A.," and he believed it was adopted largely by other companies for the purpose of educating consumers. It was a very good one. To a suggestion that it would have been better if the Gas Companies' Protection Association had taken some trouble beforehand to educate the public, witness again replied that the Association confined themselves largely to Parliamentary matters. He also pointed out that individual undertakings must choose methods according to local circumstances.

Mr. WOOLCOCK said witness had put in a plea *ad misericordiam* that there was a series of disturbing influences during the past few years, and asked what those disturbing influences were.

Mr. EDWARDS said that, in the first place, the war had disturbed the industry tremendously. Extra costs had to be passed on to the consumers; and as the price of gas increased, the dividends were reduced, which very seriously interfered with the capital value of stocks, and prohibited the issue of ordinary capital. Then there were labour difficulties; and there had been two coal strikes since the Armistice. There was also the introduction of the Gas Regulation Act, which gave gas companies new standards. From his knowledge of things, very few undertakings had yet realized what their new standards meant, because they had not had a full year's working, or had not the 1922 accounts before them. Parliament had expanded its mind largely in respect of the standard price; and he referred to the working of the newly introduced basic price, which provided against the difficulty of dividends being reduced to practically vanishing point. Parliament had stabilized certain undertakings for three, four, or five years, without revision.

Dr. CHARLES CARPENTER, C.B.E. (Chairman of the Gas Companies' Protection Association, President of the South Metropolitan Gas Company, Director of the South Suburban Gas Company, and Deputy-Chairman of the European Gas Company), in the first place explained that the "B.C.G.A." represented both municipal and company interests. This was why the Gas Companies' Protection Association had taken such a small part in connection with the adoption of the therm system. He also explained that, for the reason that the Gas Companies' Protection Association concerned themselves only with the interests of companies, they had left largely to the National Gas Council the negotiations which had led to the acceptance of the therm system and its subsequent inclusion in the Gas Regulation Act, since the proposals affected municipal corporations engaged in the supply of gas as well as companies.

The question of the most suitable quality to be adopted as a standard or standards of public gas supply had received some attention before the war; and, generally speaking, it might be stated that in various legislative enactments in and before 1914 there was a tendency to lower them, in the belief that lower costs of production would ensue. But it was circumstances arising out of the war which had influenced to a much greater degree the standards adopted by gas undertakings; and it was only common justice that these should not be overlooked to-day. He pointed out the necessity during the war, in the national interest, of extracting benzole and toluole from the gas, and how this robbed the gas of the greater part of its illuminating constituents, and reduced its heating qualities. The legal minimum quality of the gas supply was reduced all over the country to 450 B.Th.U. gross, owing to the sudden change in composition. It was to the credit of gas undertakings that the proposals were adopted without demur, although their damaging effect upon the business was soon apparent. In the majority of cases the illuminating value was the only indicator of quality; and by taking away the illuminating constituents, an important indicator of quality was lost. He pointed to the small profits made by gas undertakings throughout the war, adding that, whatever might be said about those responsible for gas supply, they could not justly be charged with profiteering. As the stripping plants got to work, the complaints of a public who had been used to their "gas as usual" began to be manifest. The difficulties under which the undertakings laboured were too generally forgotten to-day. Their staffs were largely depleted, and thousands of new men—and women too—had to be brought into the works and trained in the various operations of gas making. As a result of the change, he was bound to say the control was not as complete over the process of gas manufacture as it was before the war broke out. The extraction of benzole and toluole would not of itself have accounted for the difference in the quality of the gas supplied which was complained of. In addition, gas undertakings were faced with the difficulties of control which came about as the result of the adoption under war stress of the requirements of the High Explosives Committee. There was a good deal of outcry as to the quality of the gas about 1917, and as a result the question of the proper quality of gas to be supplied was referred to the Fuel Research Board. The recommendations of the Board were received with anything but favour by the gas industry generally; but eventually an agreement in the matter was arrived at. The Board of Trade, while admitting that gas companies had suffered great hardships from the reduced dividends paid during the war, were so impressed with the value of the recommendations of the Fuel Research Board that they had stated in effect that relief would only go hand-in-hand with the adoption of the therm system; and the companies had no other course but to adopt this ultimatum. It was important to bear in mind, therefore, that the therm system was forced upon a more or less unwilling industry, and that it was neither originated by nor acceptable to it. To-day it was satisfied that its fears were groundless, and did not seek relief from an obligation which it believed would be, in the long run, to the advantage of the gas consumer and, therefore, of the undertaking supplying him. He had not shared the previous views of the industry—that the therm system was an unnecessary complication, and that the system already in vogue, by which the quality was specified in the Acts or Orders under which undertakings were working, was quite sufficient for the conduct of their business and for the protection of the consumer.

As to complaints, he had been very much impressed with the gas undertakings outside London attending the Committee; and they had told him that this dissatisfaction with the therm was peculiar to London, and did not spread into the country at all. Even in London, dissatisfaction was not general. This contention was supported by the fact that from large districts, such as those supplied by the Commercial and the South Suburban Companies, not a single consumer or association of consumers had come forward to formulate a complaint.

The CHAIRMAN referred to a complaint which was made by Miss Cornish, of Upper Norwood, who was supplied by the South Suburban Company. The complaint was that the consumption for the Christmas quarter of last year was double that of the two preceding Christmas quarters, in cubic feet. A new meter had been put in, and the suggestion was that the old one had been slow. The amount burned was about 130 c.ft. per day, which would have made the consumption for the quarter about 12,000 c.ft., and not the 21,000 c.ft. as shown.

Dr. CARPENTER said that no doubt what had happened was that the consumer had had a new and accurate meter installed, which disclosed the fact that she had not been paying for all the gas consumed previously. This was a general assumption; but he would have the case further investigated.

Dealing with the first declaration of calorific value by undertakings under the therm system, witness said that the information received from members of the Gas Companies' Protection Association showed that in the majority of cases the calorific value declared was the same as that to which the consumers had been accustomed previously.

With regard to uniformity throughout London, in 1914 the gas supplied was, in fact, uniform in the sense that the three large Companies—the Gas Light and Coke, the Commercial, and the South Metropolitan—were required to supply a 14-candle gas; and they did actually supply gas between 14½ and 15 candles. As to the suggestion made by Mr. Ollis—that the gas supply of London should in this respect revert to its pre-war condition—the objection to this was that it departed from the principle on which the therm system was based—that each company was the best judge of what they could supply in the way of heating value.

Replying to the CHAIRMAN, to the effect that the gas supplied by the three Companies named could be used economically by the consumer, witness said that this had been tested. In the experiments a "housemaid's flame" was produced with an ordinary burner. Asked what a housemaid's flame was, Dr. Carpenter said it was the name given to a flame that would be used by a housemaid for cooking.

The CHAIRMAN: I thought the housemaid's flame was a wasteful flame. [Laughter.]

Dr. CARPENTER said it was open to that criticism. They had turned the burner on in the same way as they assumed it would be turned on by anybody using a gas-cooker. They had boiled a kettle of water, and had found that, within limits of experimental error, boiling a kettle in this way was a good calorimeter. With gases of varying quality the boiling ring used in connection with an ordinary cooker would give a *pro rata* value in accordance with the calorific value of the gas. Therefore, if they had a consumer who was always moving his gas-stove about—always supposing the adjustment was made to use the different qualities of gas efficiently—he would find he would be using the same number of therms with all three gases for the same job.

The CHAIRMAN took it the adjustment would be the regulation of the air supply to the burner.

Dr. CARPENTER agreed, but considered the best adjustment was the regulation of the nozzle through which the gas flowed. Continuing, he said that, as to the wasteful use of gas, there was no doubt that it was wastefully consumed; and this was probably the greatest enemy of the undertakings. If only one could persuade the consumers to use gas economically, he was sure that, in the long run, more gas would be sold, because it would be used more commonly, and with greater satisfaction. It was extremely difficult to teach consumers to be careful. They had with every single gas appliance the most simple device ever invented for regulating the flow of gaseous energy—namely, the ordinary plug tap. There was nothing so simple as that in the way of mechanical things; and it was necessary to educate the consumer to the fact that, with the aid of the tap, he could control his gas over an exceedingly wide range of variations, from simmering to violent boiling. Also, he could do with an incandescent gas-burner what he could not with an incandescent electric light burner—namely, turn it down to give a very small proportion of its total illuminating power. Replying to the Chairman, witness said he did not think the importance of regular pressure could be over-emphasized. It did not matter whether the pressure was at 2, 3, or 4 inches, provided the pressure was the same every morning. The cooking peak of the whole week was on Sunday. In the evenings, the peak was between 5 and 6 o'clock at this time of the year; it lasted for about a couple of hours, and then began to fall off rapidly.

The CHAIRMAN remarked that it had occurred to the Committee that while the peak was ascending the consumers were coming on more or less rapidly, and there must be a varying pressure. Was pressure put on gradually?

Dr. CARPENTER said it had to be increased gradually. This was effected in some cases by running water into a tank, so that the increase was exceedingly gradual; while in others leaden weights were used, in which case the increases were more in the nature of steps. The idea was always to give consumers a regular pressure. His Company arranged the pressures with the object of giving consumers throughout the district a pressure of 25-10ths.

Dealing with the complaint made by the Sheffield Gas Consumers' Association—that the percentage of inerts was high—witness pointed

out that in Sheffield a large amount of gas was used for industrial purposes, and therefore required high density of heat as distinct from a high quantity, and that was why low-grade gas would not be suitable for Sheffield. He thought perhaps one of the witnesses was under a misapprehension with regard to this when he had spoken of flame temperatures. The Sheffield Association were right in endeavouring to get inerts down as low as possible; and there was no doubt that the therm system was gradually bringing this about.

As to the use of governors, he was strongly of the opinion that in the Provinces their employment would be of no advantage to consumers, because main arrangements were so much more simple there than in London. The demands for gas in London had grown so largely that a special system of distribution was needed, and that system appertained to the country very little, if at all. The Association were strongly opposed to adding what they considered the unnecessary complication of a governor to the troubles they already had with regard to the meter.

Dealing with the suggestion that had been made—that meters should be tested at the gas companies' expense after seven years—he referred to the plan adopted by some undertakings some years ago, when meters were painted different colours, each one representing a particular year, and the meters were tested periodically. The system was threshed-out, and was found to be unnecessary and wasteful, because the large majority of meters were found to function accurately, and an enormous number were being brought in in order to correct the irregularities of a few. He believed the simplest plan was, first, for the consumers to have some idea of the quantity of gas they ought to use, and the amount of money they were spending for their particular requirements.

The CHAIRMAN pointed out that that varied with the price of gas. In the past the consumer knew how many cubic feet he was using; but now he was charged per therm, and he was at sea.

Dr. CARPENTER said that 999 consumers out of 1000 had no idea of how many cubic feet they were using; it was merely a question of the amount of the bill at the end of the quarter. He did not think the method of payment mattered; and if the consumer were sure that the measure (whatever it was) was accurate, he would be content with it.

Replying to the CHAIRMAN, witness said that gas lighting was now, among those people to whom efficiency and cost were important, as popular as ever. He did not think the amount of gas used for lighting was decreasing, except by reason of the fact that burners used now are more economical. In houses of a rental value of £50, £60, or £70 a year, gas was preferred in 90 p.ct. of cases. He mentioned the case of a garden city at Woolwich, consisting of some 1200 houses. Half the houses were wired for electricity; and yet in only 27 instances was electricity used for lighting purposes. Gas was used by the remainder for lighting. Those which were considered to be the most attractive, from the point of view of their frontages, &c., had been wired.

Dealing with the point that consumers' bills should be expressed in cubic feet, witness considered that undue importance had been attached to this. Few consumers interested themselves in the quantity of gas used; their real interest was the amount of the quarterly bill, and how it compared with previous quarters. As to the accounts for the June quarter, 1922, being much in excess of those of previous quarters, he believed this was not the case with either the Provincial undertakings or with those in the Greater London area (excluding the Metropolis). All companies were continually engaged in instructing their consumers how to economize in gas consumption; and this had been necessitated by no cause so great as increasing competition.

A TOTTENHAM CONSUMER AND VARYING PRESSURE.

After the luncheon adjournment,

The CHAIRMAN said a complaint had been received from a consumer of the Tottenham District Light, Heat, and Power Company of variations of pressure which disorganized his supply. In a very carefully prepared letter this gentleman asked that there should be a recommendation providing against varying pressures.

As there was no representative of the Tottenham Company present, the Chairman said the letter would be handed to the Company, and full particulars of the case might then be given to the Committee.

Dr. CARPENTER was then asked a final question or two on the case he had been presenting before lunch, prior to his dealing with the case for the South Metropolitan Gas Company.

The CHAIRMAN: Your Association are now satisfied with the therm as a method?

Dr. CARPENTER said the objections that had been put forward by the members of the Association when the matter was first discussed, proved to be unfounded. It was now believed that in the long run the adoption of the therm system would be as advantageous to gas undertakings as it would be to gas consumers, because only by this means could gas be sold on a fair basis all over the country.

The CHAIRMAN: So that the consumer actually pays for what he gets?

Dr. CARPENTER: Yes.

THE CASE FOR THE SOUTH METROPOLITAN GAS COMPANY.

Dr. CARPENTER then dealt with the case for the South Metropolitan Gas Company, who, he said, differed in one important essential from all the other companies, in that they were the first to promote a Bill adopting the therm basis; the recommendations of the Fuel Research Board having been included in the Company's Bill of 1919, and passed in the following year. The basic price in that Bill was 11d. per therm, and there was a provision binding the Company to promote a Bill not later than 1925 in relation to a revision of this basic price. Another interesting feature of that Bill of the Company was that penalties were provided for, should the calorific value fall below a certain standard, or if it went above a certain figure. This was done in order to prevent the Company's sending out a very high calorific value gas at any period to compensate for a very low one at a previous period, in order to bring up the average calorific value to the standard. This latter provision had not been found necessary in practice; but it was thought wise to include it in 1919 to avoid any possible objection on the part of consumers. While not at all suggesting that the provision against a higher calorific value was a desirable restriction and that it should be adopted generally, the point was that he was personally responsible for the suggestion, and he was not at all inclined to throw it over to-day so far as his Company were concerned. The South Metropolitan Company actually introduced the therm in September, 1920; but at the beginning of that year a start was made with the attempt to educate the public. A copy of a pamphlet, entitled "If you had the choice, would you buy gas, or the energy in gas that supplies light, heat, and power?" which was distributed to all the Company's consumers, was handed to the Committee. This fact he regarded as of importance, because it had been suggested that the public had not been sufficiently educated as regards the therm. In the case of the South Metropolitan Gas Company, the attempt to educate had been actually made before the introduction of the therm. Prior to this, he had addressed a series of letters to the Press, which were subsequently issued in pamphlet form and widely distributed. When the therm was actually introduced by his Company in September, 1920, a further pamphlet was sent to all consumers headed "The Price of Gas," in which the whole position with regard to the therm and the new price was set out. He wished to draw special attention to this, in view of the statements that the introduction of the therm had been made use of to camouflage an increase in price. This was not so in the case of his Company, at any rate. As a matter of fact, the price to the slot-meter consumers in his area was only increased by ½d. per 1000 c.ft.; and the consumers were told of this at the time.

The CHAIRMAN said Dr. Carpenter need not worry himself on that point, as the Committee were not under the impression that an increase in the price of gas had been camouflaged by the introduction of the therm.

Dr. CARPENTER said if the matter rested with the Committee he would not mind; but he was speaking in the presence of the Press, which had given a great deal of prominence to this point. He hoped the gas companies would now have a little justice in the matter.

The CHAIRMAN then dealt with a statement of the charges for gas by the South Metropolitan Gas Company since 1913-14. In 1913, the price to ordinary consumers was 2s. 2d. per 1000 c.ft., with an extra charge of 9d. to slot consumers; this extra charge remaining constant until 1920, when it was increased by the ½d. mentioned. At Michaelmas, 1914, the price to the ordinary consumers was increased to 2s. 4d.; and at Lady Day, 1915, it went up to 2s. 10d. At midsummer, 1916, it fell to 2s. 8d.; but was increased to 3s. 1d. at midsummer, 1917. At the beginning of 1918, it rose to 3s. 7d.; and in the summer of 1918 it still further increased to 4s. At Michaelmas, 1918, it was 4s. 4d., and at Michaelmas, 1919, it went to 4s. 8d., and remained at that figure until Michaelmas, 1920. Then came the introduction of the therm, and the price went up to the equivalent of 4s. 9¾d., at which it remained until the midsummer of 1921, when it rose to 5s. 3¾d., and at midsummer, 1922, it fell to 4s. 8d. In January of the current year, the price was reduced to 4s. 2·4d., or 9d. per therm; the charge to slot-meter consumers being 9½d. per therm. The present price was for the same quality gas as was supplied in 1914; and the price was a little less than double the 1914 price. Dr. Carpenter also drew attention to the fact that even during the war, when things were very difficult, the South Metropolitan Company reduced the price when they found it possible, although, unfortunately, they had not been able to maintain the reduction.

A specimen of the receipt handed to slot-meter consumers was passed to the Committee, and attention was called to the fact that this form showed the thermal value of the gas, the cubic feet, and the therms. There was also an explanation to the Committee of the meaning of the refund to the slot consumers. This was due, of course, to the fact that slot meters could be rearranged for every slight fall in the price; the slot-meter user being refunded a certain amount, to make up for the difference, by the meter reader when the money was collected. Incidentally, Dr. Carpenter expressed the view that arrangements should be made to reduce the amount of these refunds as much as possible, if only that it was not fair to place temptation in the way of collectors who had to make the refunds. This was in reference to the statement by Mr. Rumsey, that he had had as much as 4s. or 5s. refund. Dr. Carpenter also stated that he thought information of the kind set out on the receipt form handed to the Committee should be made compulsory upon gas companies in the case of slot-meter users; but he would not accept the Chairman's suggestion that it should go further, and state the price per 1000 c.ft., because he felt it was necessary to get used to the one system—the therm. It would not tend to that if they continued the two systems side by side. If the old one was an inaccurate one, as had been generally agreed, then it would be a pity to continue it at all. It would not be long before the consumer thoroughly understood the therm system. As a matter of fact, after the attempts to explain the system that had been referred to, the Company's officials thought everything was working smoothly in regard to the therm system, and felt quite happy about it.

Dealing with the ordinary consumers, Dr. Carpenter said in his district they had meter cards, although this practice was not universally adopted. In the present absence of a therm meter, the meter reader recorded the cubic feet and the equivalent therms, which he was able to do from a table with which he was provided.

The CHAIRMAN said this seemed a very complete meter card.

Dr. CARPENTER, in answer to the Chairman, expressed the view that meter cards should be compulsory. Continuing, he said that so completely did the therm system seem to be functioning in 1921 that the practice of giving information with regard to the therm on the backs of the accounts sent to the consumers was discontinued; but when it was seen how things were going in the summer of 1922, the advertisements on the backs of the bills, which had replaced the particulars as to the therm, were discarded and therm information again given. At the same time notice was given of a change in the calorific value from 550 to 560 B.Th.U. As a matter of fact, the Press agitation did not increase the number of complaints in their case; the figures for the June quarters of 1920, 1921, and 1922 being 409, 363, and 401 respectively, out of something like 400,000 consumers.

Asked by the CHAIRMAN when the Press agitation commenced, Dr. Carpenter said he believed it was started by a letter from a gentleman named Reid, the Manager of Pleno, Ltd., in June, 1922, or thereabouts; but he was not sure.

The CHAIRMAN: If anyone has a complete file of the newspaper agitation, the Committee would be glad to see it.

Mr. OGILVIE (National Gas Council) said the Council had such a file, and would let the Committee have it.

Dr. CARPENTER said that when the giving of information about the therm was continued, a leaflet, headed "Truth about the Therm," was issued in August, 1922, followed, two or three weeks later, by another headed "More about Therms." A great deal had been done generally to educate the public, quite outside the Company's own district. Incidentally he mentioned the effect of the coal strike of 1921, when the price of gas was increased from 10½d. to 11½d. solely on account of the strike. A stock of coal had been laid in; but the strike lasted longer than had been anticipated, and the Company had to buy coal abroad and obtained some very poor stuff. The worst, however, was coal that had been sent from this country to France, at a time when France was badly off for coal; and it came back here under the circumstances of the coal strike. The reason why the Company had attempted to do some general education of the public was that the gas industry was peculiar. In the steel industry, if a man supplied poor steel the effect was to injure that man or firm, and not the industry generally. In the gas industry, however, if the policy of any one company came into question, and especially if it were an important company in a large city, the effect re-acted upon the whole industry. This was why the leaflets issued in the summer of 1922 were circulated all over the country, and not only among the Company's own consumers. The suggestion had been made that the gas industry had not utilized the Press sufficiently for this purpose. One reason was that the price of the front page of a certain paper used to be £250, but was now £1250. Against that, he had received one letter from a consumer complaining of the spending of the Company's money on Press advertising, and stating that it was only done to square the Press. Such was not the reason; it was solely with the idea of educating the general public, and to get over the prejudice with which many people, through want of knowledge, regarded the therm system.

Reference was then made to the intervals at which meters are read in the South Metropolitan Company's district, and the difficulty of introducing monthly accounts in their area. Dr. Carpenter did not believe this would be popular among the ordinary consumers, although some provincial towns had adopted it. As to the suggestion that when the meter reader called he should, in addition to recording the reading on the meter card, hand to the householder a slip containing the amount consumed, he did not see that this would serve any good purpose, as it would simply duplicate the meter card. The majority of such slips would find their way into the waste-paper basket.

Dr. CARPENTER then wished to speak about the assertions that the standard price had been fixed too high.

The CHAIRMAN said it was not germane to the inquiry, and need not be bothered about.

Dr. CARPENTER, however, was allowed to make a few comments on this point. He said it all went to the charge that had been made—and he was not at all sure it was not being made to-day—that the change-over to the therm system had been used more or less as a dodge to raise the price. All he wished to say was that when his Company proposed to introduce the therm system, they called in an independent firm of accountants to go through the whole of the books and advise as to the fair price to fix as the basic price; and 11d. was advised, which was, of course, subject to revision, as already mentioned. If there was to be considerable instability in the matter of price, it would be bound to react upon the consumer in the wrong way, because the price of gas would be higher on account of the largely increased cost of capital.

Passing to the circumstances which attended a temporary change in the calorific value of the Company's supply, Dr. Carpenter stated that the pre-war quality was 560 B.Th.U. Under the therm system, however, the Company's engineers were afraid they might not be able to stand-up against the greater severity of the tests unless they had a lower figure; and so the figure of 550 B.Th.U. was adopted when the Company made their declaration. Personally he did not, at the time, believe that the fears were well founded; and experience had proved this view to be right, notwithstanding the London County Council carried out from 4000 to 4500 tests a year on the Company's gas. Now they had reverted to the pre-war standard of 560 B.Th.U.; and it was a pity that the original change had been made, although he did not think anyone was injured by it. The reason for his own view in standing out for the higher standard all through was the knowledge of the large number of flat-flame burners in use. There were very few gas consumers in South London who did not have one flat-flame burner; and these were used as a source of heating as well as lighting—for instance, for taking the rawness off the atmosphere in a bedroom in the morning. From this point of view, unless there was a great advantage in a non-luminous gas which outweighed these other considerations, it was desirable to maintain a supply which had a certain luminosity. The South Metropolitan Company supplied a straight coal gas without any admixture, and they had not the plant to mix other gases. Moreover, the records during the war showed that the consumer was able to have a luminous gas at a much cheaper price per therm than the low-grade gas.

The CHAIRMAN: Do you think that is probably true of the future also?

Dr. CARPENTER replied that he believed experience would tend in this direction. Since 1914, he could certainly say that the gas consumer in London had had his therm at a considerably lower price where the gas had a luminous value than where it had not.

The CHAIRMAN: You mean the richer the gas the cheaper?

Dr. CARPENTER said that was so up to a point. Exactly to what point he could not say at the moment; but up to a certain point the richer the gas the cheaper it was to manufacture and to distribute. He felt he could support this by the fact that the therm in the case of the South Metropolitan Company was 9d., as against 10d. by other companies.

Passing to the question of pressure, Dr. Carpenter referred to the efforts of the South Metropolitan Company to maintain during the past twenty years a constant composition and quality of gas at regular pressures; and he exhibited one of the burners which his Company made with this object in view. In this burner there was no means of adjustment by the consumer; reliance being placed upon the constant quality and pressure. He claimed that much greater efficiency was obtained in this way than with varying qualities and pressures, leaving the consumer to adjust the fitting as was possible in the ordinary way, because such fittings were usually badly handled, and the result was unsatisfactory. A different fitting was made for the north of the Thames to that for the south, to provide for the difference in the gas. Last year the Company supplied between 80,000 and 90,000 incandescent burners, and over 40,000 flat-flame burners of this special type, partly for new work and partly for replacements. The most important thing in using burners of special types to suit a particular gas was that the gas should be of a regular composition and density—*i.e.*, the energy of the jet should be uniform; and this uniformity depended upon the specific gravity of the gas *plus* the pressure. If this was secured, then burners could be left burning all night with every safety. One reason for the particular kind of incandescent burner which he had shown was that it could easily be cleaned without being taken to pieces, as was necessary with the ordinary adjustable burner. These burners had simply to be blown through to clean them. The Company had also given a great deal of attention to the question of a standard mantle, and rejected all the mantles which did not come up to a prescribed standard. These mantles were used where the consumer's fittings were maintained by the Company. Unfortunately, those which were rejected by the Company were sent to other districts where the gas companies were not so particular. At the same time, in order to prevent the South Metropolitan consumers, whose fittings were not maintained by the Company, from getting these mantles, the Company had 200 agents in their area who sold the mantles as passed by the Company; these mantles being manufactured by two or three mantle firms who made to the standard laid down by the Company. If a consumer bought other mantles, he did not get such good service—very often the mantle broke, and this had the effect of the globe also breaking. He did not know whether it would be out of place to suggest that in his opinion, every gas company should be required to test the whole of the apparatus which they supplied to their consumers for hire or hire-purchase. The responsibility for the efficiency of it should be upon the gas company, instead of leaving it to the manufacturers. In most cases cookers, for instance, were sent out to the consumers just as they were received from the manufacturers, without any test. It certainly was not the universal practice to test the apparatus. In many cases the gas companies accepted the apparatus from the makers without assuring themselves that it was as it should be. The difficulties were exceedingly great; and they had not yet reverted to the pre-war condition of things. It was a fact that 60 p.ct. of the value of gas appliances went back to the manufacturers, because for some reason or another they were inaccurate or defective. It was an exceedingly difficult thing to-day to get the manufacturers of apparatus and appliances required by gas undertakings to maintain their goods at a high standard of quality. His own Company tested everything before it was used. Even when it was in use, it was inspected regularly every year. On this point he specially referred to the complaint of Mr. Thomas, of Tooting, who had said that his apparatus was not regularly inspected. Dr. Carpenter handed to the Committee the inspector's cards showing the visits that had been made. Apparatus was put in order, and defects in the apparatus and pipes reported, and seen to. This applied to both ordinary and slot consumers.

Dr. CARPENTER then took up the references that have been made as to the practicability of designing a therm meter. There was not the least difficulty in making one—indeed, he exhibited both a therm meter for the use of ordinary consumers, and an attachment for slot meters which enabled the registration to be by therms instead of cubic feet. The charm of the latter was that the scale would only need to be altered when the calorific value was altered. The therm meter for ordinary consumers had been deposited with the Standards Department of the Board of Trade; and there was no reason why it should not be stamped. The Department had said, however, that they would not stamp the meter until the Committee had reported. Perhaps, as a matter of policy, this was the right course to adopt.

Dr. Carpenter then explained the operation of the therm meter to the Committee. It was an ordinary meter, with the necessary modification; and the ordinary meters could be altered for the purpose, although the meter shown was a new one. The attachment for converting a therm meter into a slot meter indicating therms was the invention of a lady; and as the measurement was in therms, it would obviate the necessity for refunds to the consumer, as at present, when a change was made in the number of cubic feet for the coin put into the meter. The consumer, with the new meter, would get practically his full value upon placing the first coin in the meter. As a matter of fact, he would get up to, and even substantially above, the indicated capacity of the meter with the first operation of the mechanism; and as the time approached when the supply of gas thus pre-paid became exhausted, the valve began to close and gave the consumer warning that a further coin was necessary. While not suggesting that these meters should be made compulsory, he thought their possibilities should be borne in mind. Reverting to the form of receipt given to slot-meter users, Dr. Carpenter expressed the view that there should be stated upon this the price of gas in therms, the price of fittings-hire per therm, and the consumption of gas in therms.

In his concluding remarks, Dr. Carpenter said he had been connected with the gas industry for a great many years, and especially with the supply of gas in London; and he hoped he would not be out of order in making a further suggestion to the Committee. The supply of gas in the Metropolis was of such great importance, and was on such a large scale, that any change with regard to the principles upon which it was carried out should continue to be as the result of inquiry by Parliamentary Committees and not by an official of the Board of Trade.

The CHAIRMAN: That is to say, you do not want an inquiry by experts?

Dr. CARPENTER: These matters should be inquired into by a Committee who have the advantage of the fullest expert advice it can possibly have.

The CHAIRMAN: Why would you limit the inquiry to a Parliamentary Committee?

Dr. CARPENTER said it was for this reason—that the policy appertaining to gas supply throughout the country had been based almost

wholly upon the practice in London. The practice in London had been laid down as the result of exceedingly careful inquiry from time to time; and to a very great extent it had been accepted as standard throughout the country. The gas revenue of the three London Gas Companies was some £12,000,000 in 1921; and the suggestion that a Parliamentary tribunal was an expensive one could be ruled-out when the large amount at stake was considered. In the case of the Provincial companies, London legislation would form a useful model in the future, as it had done in the past. He felt sure that it would be to the advantage of the consumers in London, and of the gas industry as a whole, if the practice which was adopted before the Gas Regulation Act came into operation was continued—*i.e.*, that all changes in the principles or their application, in the case of the London gas supply, were the result of an inquiry before a Parliamentary Committee.

Answering further questions by the CHAIRMAN, Dr. Carpenter said the present practice under the Gas Regulation Act by-passed the Parliamentary tribunal.

The CHAIRMAN: But that does not over-ride the right of a company to promote a Bill in Parliament.

Dr. CARPENTER agreed; but he was looking at it from a broader standpoint, and suggesting that the consumer would get a better protection in the case of London if changes in the policy or practice were made the subject of a Bill. He attached the greatest importance to this because it would, he believed, in the long run be advantageous to the consumer and to the gas industry as a whole.

The CHAIRMAN: We will make a note of that evidence. We are a Committee appointed by the Board of Trade, and can hardly report along these lines. [Laughter.]

Dr. CARPENTER had the greatest respect for the Board of Trade; but they had not the same ability as was afforded by the procedure entailed by going before a Parliamentary Committee.

The CHAIRMAN: Your point is that the substantial changes in the affairs of the gas industry should be dealt with by Parliament?

Dr. CARPENTER: I confine it to the Metropolitan gas industry. Changes should be decided by Parliament; and this should form the procedure for the Board of Trade in reference to other undertakings in the Provinces, by Order or under the Gas Regulation Act.

This closed Dr. Carpenter's evidence-in-chief.

Mr. BALFOUR said he had little to ask, as he had been satisfied with Dr. Carpenter's answers to the Chairman.

Dr. CARPENTER, questioned as to faulty taps, said an inspector would report the existence of these. Unfortunately, there was no standard tap. At the present time there was a large number of taps with only a brass pin to stop the tap being turned right round; whereas a tap should be of the kind in which half the brass was cut away, preventing the tap being turned again accidentally, as was the case with the other type if the pin broke or bent. Some such fitting as he had suggested should be made compulsory—indeed, the whole question of fittings needed investigation by the gas companies. They would be the best people to formulate some rules which should be adhered to by every supplier of apparatus; and it should be an offence to supply fittings which did not comply with these rules. As to geysers, his Company absolutely declined to fit a geyser where a compartment was not, or could not be, properly ventilated. Unfortunately, very often when the Company would not fix a geyser, the customer brought in somebody from outside, who fixed one regardless of whether the position was suitable or not. In many cases it was not safe to fix a geyser in a bathroom, although in the majority of cases it was. It was all a matter of efficient ventilation.

Sir JAMES MARTIN said Dr. Carpenter's evidence had dispelled a good many of his doubts. At the same time, there was one point he wished to raise. In his evidence in the morning, Dr. Carpenter had expressed the opinion that the customers were less concerned with how much gas they had used than with the amount of the quarterly bill, and how that amount compared with the previous quarter. Was not this rather an allegation of want of intelligence.

Dr. CARPENTER said he was bound to say that he did not think the average person was very intelligent in these matters, and he also believed that the average person used gas unintelligently and also wastefully. It would be a great help if consumers could be regarded as full of intelligence in these matters. Many of the difficulties of the gas companies were to teach the consumer the importance of these problems.

In answer to other questions, Dr. Carpenter said what he wanted was to get the consumer to think in therms and nothing else. It was not necessary that he should know all about a therm—for instance, the average user of electric light had not the faintest conception of what a unit of electricity was. What was wanted was that the gas user should come to recognize that the therm was the proper basis of measurement of gas.

Mr. WOOLCOCK, at the beginning of his questions, asked if Dr. Carpenter agreed substantially with the answers given by Mr. Edwards, and was told that this was the case.

On the question of putting the cubic feet and the therm and the price in both cases on the bills and meter cards—a practice which Dr. Carpenter had previously said he did not think was necessary—Mr. Woolcock pointed out that at the time the quantities in the British Pharmacopœia were changed from English to metric measurements, the two systems appeared side by side for a certain period until people got used to the metric system.

Dr. CARPENTER said he would have no objection to the therms and the cubic feet appearing on both bills and meter cards for a certain period. His idea was that the public should not use cubic feet at all, but recognize that the therm was the proper basis of measurement. Both, however, might appear during the transition period, which should be fixed at a reasonable time. He would be sorry if anything were done to weaken the stability of the therm basis; and this had been impressed upon him more than ever during this inquiry.

Mr. WOOLCOCK then raised the question of the meter reader leaving a slip giving the meter reading as well as placing the figures on the meter card, but Dr. Carpenter could not be brought to agree that it was necessary. It only meant a greater use of the waste-paper basket and more work for the dustman. It would put extra duty on the man and increase the cost of the work, without serving any useful purpose.

As to the evidence on behalf of the Institute of Chemistry regarding the qualifications for gas examiners, it would be desirable to have these as high as possible; but at present the result might be that there would not be sufficient persons with the requisite qualifications. This was really a matter for the Gas Referees.

Dr. CARPENTER was emphatic when he said he could not agree, as had been suggested in some of the previous evidence, that half the apparatus in London was out-of-date. This must have been said by a person who was not familiar with London—the statement could never have been made by anyone who had taken the least pains to ascertain what was really the fact. The best answer to this was to suggest that the Committee should go and see for themselves the type of apparatus in use, and also the type being sent out by the gas companies. This would be much more valuable than theorizing on the part of individuals who had no opportunity of knowing the facts.

Mr. WOOLCOCK: What percentage would you say is at present unsuitable and in the transition period of being replaced?

Dr. CARPENTER said that lighting burners were always being replaced, and cooking apparatus was becoming more and more perfect. He had no doubt that the majority of the cocks on gas-cookers were of the brass-pin variety to which he had referred; but they were being rapidly replaced with more suitable appliances. It was impossible to say how many were unsuitable. All he could say was that apparatus was being continually tuned-up and modernized. What was out-of-date to-day was a very good type of apparatus in 1914. There was a little misapprehension as to the extent to which an appliance such as a boiling ring became old-fashioned. As a matter of fact, a boiling ring was a boiling ring, and had been so for very many years. The present form was more or less a survival of the fittest. It was perhaps possible to have a more scientific and efficient piece of apparatus; but it must be borne in mind that if they placed on the market apparatus which required careful and scientific adjustment, it would have to be handled by people who did not understand it.

There was here a further explanation of the working of the South Metropolitan Gas Company's incandescent burner, for the benefit of Mr. Woolcock, who was told that it worked well with pressures between 15-10ths and 25-10ths, although 15-10ths was getting near the point where the best result was not likely to be obtained. The burner in question was designed for 25-10ths; and it worked as well in his flat at Westminster as it did in South London, and was able to take care of varying pressure within limits. If there was an increased pressure, there would be an increased velocity in the jet and a more efficient flame, in the same way that high-pressure gas gave a better light due to the higher pressure.

Mr. WOOLCOCK then referred to some evidence given previously as to governors, and quoted the following statement from one of the letters read during the morning:

> "The gas companies will never admit the necessity for governors, because they produce too great an economy; but it is obvious that consumers' appliances cannot be adjusted to work economically with pressures varying from 3 to 4½ in. One cannot sit by and adjust the tap, as suggested by one of the witnesses—it must be done continuously and automatically; and that is the function of the gas governor."

Dr. CARPENTER agreed that if it were practicable to fix a governor on every burner, there would be exactly the quantity of gas flowing through for which the burner was rated; but it would be an exceedingly cumbrous piece of apparatus, and would probably go out of action in a very short time owing to the difficulty with regard to dust. They had some experience years ago with a governor which could have been fitted to the burners; but the cost of doing so would have been enormous, and in many cases they would quickly have been ineffective.

Questioned by Mr. WOOLCOCK on the subject of high-grade *versus* low-grade gas, who said there must be some reason why the South Metropolitan Company had stuck to the high calorific value gas, Dr. Carpenter replied that if he were compelled to supply a low-grade gas, he would be pushed a long way on the road to having to shut the business down, owing to the cost of the larger mains and services and increasing the size of the meters for the low-grade gas. The cost of increasing the size of meters and fittings would spell ruin.

Mr. WOOLCOCK said that would be the effect on the Company; but what would be the effect on the consumer? He referred to the figures of efficiency for boiling a kettle mentioned by Mr. Helps last week.

Dr. CARPENTER said these figures showed very little difference in efficiency as between the high-grade and the low-grade gas, and there was no reason why a kettle should not be boiled by such a low-grade gas if the gas were obtainable conveniently. The example of boiling a kettle, however, differed from the many other uses of gas. For instance, a high temperature was not required, as the temperature of the water would not exceed 212°. Neither did they require a flame which would radiate and give a high radiant efficiency. It was simply a question of converting the heat of combustion into boiling water; and this could be done just as well with a 250 as with a 560 B.Th.U. gas, although there would certainly be more gas used in the case of the low-grade gas—in the proportion, at least, of 250 to 560—to boil the kettle in the same time. There was no difficulty about boiling the kettle with the low-grade gas. The difficulty came in when that same gas was required for lighting or for gas-fires; then the same efficiency would not be obtained. This also applied to the use of gas for industrial operations.

Mr. WOOLCOCK asked why the same efficiency would not be obtained.

Dr. CARPENTER replied that it was a question of flame temperature.

Mr. WOOLCOCK, referring to Mr. Helps's evidence (although he did not say so), said he had a case in which it was stated that with a 600 B.Th.U. gas the flame temperature was 1920° and that of the 300 B.Th.U. gas 1780°—not a very great difference.

Dr. CARPENTER: "Ah! the difficulty is that knowledge is a dangerous thing; and that table is a dangerous thing if it is not read intelligently." There was loud laughter at this, in which Mr. Woolcock heartily joined; but Dr. Carpenter hastened to add that he did not mean that remark to apply to Mr. Woolcock. He was referring to the circumstances in which the table had been put forward. The amount of

heat was not proportional to the temperature, but it varied with the integral power of the temperature attained. Flame temperature was one thing and radiation effect another. If they took a body heated to 1750°, that would radiate more heat than one heated to 1500°, and the ratio of flame temperature might be as 1 to 1·1 or 1·2. The radiation effect, however, would be very much higher, of the order of 1 to 1·5 or 1·6. This was why he differentiated between the effect brought about by the kettle boiling and other uses. It would not be fair to base a case solely on the boiling of a kettle, having regard to the fact that this was only one of the uses of gas.

Dr. CARPENTER then showed the Committee a series of cards referring to the lighting load of the South Metropolitan Gas Company for 24 hours a day for seven days a week for two years; his object being to dispel the misapprehension that might exist, as the result of some of the evidence, as to the extent of the gas-lighting load. The curves showed that the lighting load is to all intents and purposes as important as the industrial load. The curves were not prepared for the purposes of the inquiry, but were maintained for the Company's own use. This demonstrated that the lighting would be seriously affected, as would other uses, if they were to be compelled to have a low-grade gas on the example given of the boiling of a kettle.

Asked as to the circumstances which would have to supervene in order that (say) a 280 B.Th.U. gas might be used universally, Dr. Carpenter said it could only be used universally if the lower-grade gas could be made so much more cheaply that it enabled a sinking fund to be set aside to pay for the increase in the size of mains, services, meters, and fittings. It could not be done otherwise. There was an analogy in the roads. It would be an enormous improvement to widen all the roads in London to (say) 120 ft., but it would be impracticable; and for the same reason it would be impracticable to supply London with low-grade gas, because of the upheaval of replacing mains, &c. Finally, Dr. Carpenter said one of the strongest reasons for continuing the therm system was that it afforded a direct and accurate comparison between different gas undertakings. It was highly important, not only for the consumers but for the public authorities, that there should be that comparison.

At the close of the questions by the Committee,

Mr. GEORGE HELPS asked to be allowed to put a few questions to Dr. Carpenter, through the Chairman. This was allowed.

Dr. CARPENTER agreed he had had no experience with low-grade gas.

Mr. HELPS thereupon complained that Dr. Carpenter should have expressed opinions as to the disadvantage of such gas for gas-fires.

Dr. CARPENTER said he had referred to the question of flame temperature in that connection, and had pointed out that flame temperature in itself was a most misleading basis of comparison in ascertaining the radiant efficiency.

Mr. HELPS agreed, but added that, as Dr. Carpenter had admitted he had had no experience of low-grade gas, he was not therefore in a position to express opinions as to its use.

Dr. CARPENTER replied that that question could be answered in half-an-hour in any chemical laboratory.

Mr. HELPS then got Dr. Carpenter's agreement with him that the nipple of the burner is the only place where the pressure should be measured, and that the nearer it was possible to approach to the completely combustible mixture, the better the result.

Reference was then made to the question of whether 50 p.ct. of gas apparatus in London is out-of-date. Mr. Helps said he should say that 9 out of 10 pieces of apparatus, not only in London but throughout the country, were wasteful; and he asked Dr. Carpenter whether he thought any harm would be done to the gas industry if independent tests were made of the apparatus under the conditions in which it was actually used. He himself had done this.

Dr. CARPENTER replied that he assumed that when a statement was made such as that 50 p.ct. of apparatus was out-of-date, it was made as the result of a thorough investigation into the matter. He could not imagine such a statement being put forward unless there was some authority behind it; but he could not imagine that authority existing in this case.

Mr. HELPS stated that he had tested several times in London and other places.

The CHAIRMAN: You said that last time. What is your next question?

Mr. HELPS said it was to ask Dr. Carpenter if he did not think that a system such as that in use at Nuneaton, which gave complete satisfaction to a large railway company like the L. & N.W. must be satisfactory.

Dr. CARPENTER replied (amid laughter) that if he were to repeat in that hall what he had been told about the feelings of consumers in Nuneaton towards their gas supply, he should expect to be had up for libel—not because it was not true, but because it was damaging.

Mr. HELPS: That would only be hearsay. If Dr. Carpenter will come down to Nuneaton he will find that is not so.

Mr. H. E. GRAINGER said he represented a consumer, and, in regard to what Dr. Carpenter had said about the readings being on the slot consumer's slip, he handed up some receipts to disprove this.

The CHAIRMAN, after looking at the receipts, remarked that these referred to the Brentford Gas Company, with which Dr. Carpenter was not concerned. The sheets were handed back to Mr. Grainger.

Mr. SAMUEL TAGG, Engineer and Manager of the Preston Gas Company, was then called.

The CHAIRMAN said that many of the points dealt with in the statement of evidence handed in had already been covered in the previous evidence, and therefore it would not be necessary to go into these.

Mr. TAGG stated that the declared calorific value of his Company was 480 B.Th.U., and the standard price 16·4d. per therm. At the present time, the price of gas in Preston was 12d. per therm less 15 p.ct., and there had been no increase in the number of complaints because of the introduction of the therm system. In the Provinces it was not usual to have meter cards. The account rendered to the consumer gave the meter reading; and unless the consumer kept his demand notes, he had no means of checking the consumption of one quarter with that of another. The objection to the meter card was the cost. At present the meter reader made the record in his book. Another difficulty was that in Lancashire towns it often happened that when the meter reader called he found no one at home, and he either let himself in with his own key or used a key left by the householder with a neighbour.

The CHAIRMAN then brought out the point made—in the statement of Mr. Tagg's evidence—that at Preston there are 30 fitters engaged on fixing, maintaining, or repairing burners, fittings, and cookers, and that during the last six months, 6722 visits were made free of charge to the consumers.

Mr. TAGG added that on these visits the apparatus was generally looked to and put in good working order. The pressure at Preston was 35-10ths to 30-10ths, and 35 p.ct. of the gas supplied was used for lighting and heating for industrial purposes. As regards governors, he did not think they would be practicable. To fix a governor of not less than ¾ in. diameter at the outlet of the meter would cost 50s., and the cost to the consumer would not be less than 5s. per annum. The capital cost to his Company would be £80,000.

A table of figures was then handed to the Committee, showing the reduction in pressure with the increasing number of appliances in use at any one time. With an initial pressure of 31-10ths, this was reduced to 30-10ths when 10 lights were being used. When the cooker was put on, the pressure was reduced to 25-10ths; when the water circulator was added, the pressure fell to 20-10ths; when one gas-fire was burning, the pressure fell to 18-10ths; two fires, to 16-10ths; three fires, to 14-10ths; four fires, to 12-10ths; and with five fires, the pressure dropped to 10-10ths. Thus, as one appliance after another was added, the pressure at the nipple was reduced; and if the initial pressure had only been 20-10ths, then, of course, the range of apparatus that could be used was much restricted. The pressure would only be of use in Preston down to 15-10ths; so that in the figures he had mentioned, the last three items would be used inefficiently.

On the question of the extent to which lighting formed an important part of gas business to-day, Mr. Tagg said that in Preston there were 34,000 gas and 3000 electricity consumers. During the past 14 years there had been an addition of 1200 electricity consumers (included in the 3000 already mentioned), and 6600 gas consumers (also included in the total already mentioned), so that the public in an industrial community were very much dependent upon a supply of gas for lighting. This was recognized by his Company, and the lighting was regarded as a very important part of the business.

Mr. R. J. NEVILLE-NEVILLE, M.P. (Chairman of the Brentford Gas Company), speaking with reference to what Dr. Carpenter had said concerning the manner in which the South Metropolitan consumers' apparatus was tested before being sent out, said he should not like it to be imagined that the South Metropolitan Company was the only Company who did this. It was also the practice of the Brentford Gas Company to test, most thoroughly, every piece of apparatus before it was sent out.

Mr. F. W. GOODENOUGH said he wished to say the same thing on behalf of the Gas Light and Coke Company.

This closed the evidence; and the CHAIRMAN announced that there would be no further public sittings of the Committee.

Electricity Stoppage at Ilkeston.—There was a strange accident last Saturday, when the Derbyshire and Nottinghamshire Electric Power Company changed-over at noon from their power station at Ilkeston to the new works at Spondon. At 6.45 p.m., when the streets at Ilkeston were full, the current suddenly failed. The trams came to a standstill in the streets, and shops supplied with electricity were in darkness. This continued for over half-an-hour. It was explained that the stoppage had been caused by an engineer becoming entangled in the machinery at Spondon. Fortunately he was not seriously injured.

Prepayment Meter Theft.—Admitting at Salford a charge of stealing 17s. 1d. from an automatic gas-meter at the house where his wife and he lodged, Albert Henry Brown said he took the money to provide food, but it was his intention to pay it back as best he could. It was stated that on being discharged from the army in 1919 he managed to get a little casual work at the docks; but he had not been employed at all for two years. Detective Sergeant Lane spoke of the accused's promise as a footballer. He had played for the Salford team. The Stipendiary Magistrate said he did not want to turn the prisoner into a criminal. Brown was bound over for twelve months.

Federation of British Industries and Labour.—The Federation of British Industries has for some time past been the object of attacks on the ground that it is conducting a campaign for the lengthening of working hours and the reduction of wages. In view of these attacks, the Federation wishes to state categorically that any such suggestion is utterly untrue. The Federation is precluded by its constitution from taking any part in regulating the relations between employers and employed. It deals solely with commercial, financial, and technical questions, in regard to which it promotes the interests of its members, and therefore also of their workpeople. Questions affecting the relations between employers and employed are dealt with by other and completely independent parties.

Co-Partnership in Industry.—Many supporters of the Labour Co-Partnership Association were present last week at a dinner at Slater's Restaurant, Strand. Lord Robert Cecil, M.P., presided, and, proposing the toast of "Co-Partnership," said that believers in the principle could congratulate themselves on the advance that had been made towards the opinions they held. No one could say that the organization of industry was perfect; and everyone was coming to the conclusion that fundamentally the change required was something which would break-down the distinction between employers and employed. The important thing about co-partnership was the conception by the employee that he no longer let out his labour for so much money, but that he had become an associate in the business, and worked, not merely for his own advancement, but for the prosperity and welfare of all associated with him. Dr. Charles Carpenter and Mr. G. W. Paton, who responded, bore testimony from personal experience to the success of co-partnership. The former urged that it was essential to humanize the industrial machine. The best method had been proved to be co-partnership.

GAS AND SMOKE ABATEMENT.

With reference to the subject of gas and smoke abatement, Mr. Walter Foulston, the Secretary to the Sheffield Gas Consumers' Association, has addressed to "The Times" the letter reproduced below.

In pursuance of our campaign for a supply of gas for industrial purposes at a price, either in therms or in cubic feet, more in keeping with the general rise in commodities since 1914, the Sheffield Gas Consumers' Association gave evidence before a Board of Trade Committee recently [see "JOURNAL" for Dec. 27, p. 806]. We send you the following figures, which show how smoke abatement by the substitution of gas for coal is being hindered by the present prices charged for gas:

	Cost of 1 Therm.	
	1914.	To-day.
Industrial coal delivered in works from same colliery and of same quality .	0·52d.	0·85d.
Gas, lowest tariff	1·82d.	6·20d.
Gas, highest tariff	2·73d.	8·00d.
Ratio, between coal and lowest tariff for gas	1 to 3 5	1 to 7·3
Ratio, between coal and highest tariff for gas	1 to 5·3	1 to 9·4

Heating operations which formerly were economically conducted with gas at 3·5 to 5·3 times the cost of coal must now be conducted at a cost of 7·3 to 9·4 times that of coal, or discontinued. Few heating operations can stand this disproportionate cost, and the result is that resort is again made to coal and coke fires.

Manchester Gas Charges—Another Big Reduction.—The cry all over the land has been, since the war, "make the charges for gas as low as you can, and thereby encourage the use of gas, and, incidentally, add to the health of the people and the purity of the air." Right well has Manchester responded to this cry; for in less than a year the Gas Committee have knocked 1s. 1d. per 1000 c.ft. off the charges. Last Friday the Committee, meeting under the presidency of the Chairman (Sir William Kay, J.P.) decided to take off 6d. per 1000 c.ft. in addition to the 3d. and 4d. taken off in the course of the past year. This brings the charge down to 3s. 5d. per 1000 c.ft. for lighting and domestic purposes, less 2d. per 1000 c.ft. if the account is paid within a month after delivery. The charges to large consumers are proportionately lower. Stretford brought its price down to 3s. 11d. per 1000 c ft. a few weeks ago, stating that the lowered charge would apply for six months as from last September. This put the Stretford consumers on a par with those of their big neighbour.

TRADE NOTES.

Hulett's Price-List.

Messrs. D. Hulett & Co., of Nos. 57 and 58, Chancery Lane, London, W.C., forward an illustrated list giving revised net prices of their specialities—the "Hulo" superheated indoor lamp, patent wall supports, and syphon pumps and service cleaners.

A Suggestive Desk Pad.

Messrs. R. & J. Dempster, of Manchester, have sent us an interesting desk pad for memoranda purposes. It has been compiled to be of special use to the industry. At the beginning of each month, the busy engineer will find a gentle reminder of the "needs of the moment." For instance, before entering on the month of February, we read: "Prepare for renewal of retort-settings, and obtain early delivery of materials required, so as to avoid disappointment." When approaching March, there is an invitation to "consider repairs to be undertaken during summer to roofs, buildings, and apparatus." So month by month, there is reminder of something or other. In short, in this pad we have novelty and (in more senses than one) utility combined. The little jogging of the memory that is given can be classified under the term "utility."

A Monthly Note Book.

We are pleased to receive a neat little booklet which Messrs. Samuel Cutler and Sons are issuing monthly to their large circle of friends and customers, entitled the "Gas Engineers' Monthly Diary." The first issue for February is to hand, and contains some novel features: A condensed set of useful tables, a therm chart for converting at a glance gas prices from therms to cubic feet for varying calorific values, a fixture list for the meetings associated with the gas industry, an article on some gas engineering topic, and a diary and note book for the month. The size is handy for the pocket; and no doubt it will serve, as we understand it is intended, for rough notes in the course of one's daily routine of business, whether in the works or at the office table. That is the purpose for which we shall use it.

London County Council and Gas Supply.—The following was moved by Mr. Morrison, at last week's meeting of the London County Council: "That it be referred to the Public Control and General Purposes Committees to consider and report as to (*a*) whether or not legislative or other steps should be taken to secure that gas companies should not, as has been alleged, spread illness and death by poisonous fumes, whether as a consequence of imperfect gas or faulty mains or pipes inside or outside buildings; and (*b*) whether or not recent enterprise on the part of the electricity undertakings of the Metropolitan Borough Councils of Hackney, Poplar, St. Marylebone, Stepney, and Woolwich tend to show that gas is no longer necessary to the running of a house in respect of lighting, heating, or cooking." The motion was adopted without discussion.

Braddock's Gas Station Meters

No. 245.—BRADDOCK'S 1500 LTS. WET METER.

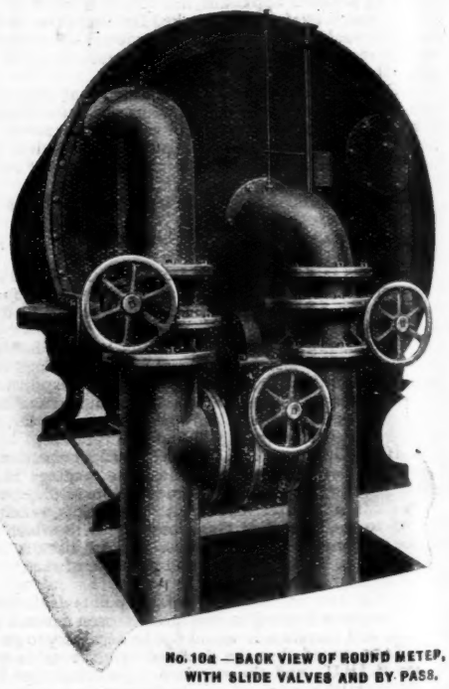
In Cylindrical Cases, for from 500 to 30,000 cubic ft. per hour.

The Best in the Market.

Dimensions and Full Particulars upon application.

OF SUPERIOR QUALITY AND CONSTRUCTION.

May be seen working up to full capacity before delivery.



No. 10a.—BACK VIEW OF ROUND METER, WITH SLIDE VALVES AND BY-PASS.

J. & J. BRADDOCK, (BRANCH OF METERS LIMITED). **GLOBE METER WORKS, OLDHAM**

Telegrams: "BRADDOCK OLDHAM." Telephone No. 815.

AND **45 & 47, Westminster Bridge Road, LONDON, S.E.**

Telegrams: "METRIQUE LAMB LONDON." Telephone: No. 2412 HOP.

THE NORTH-EAST COAST COAL TRADE.

From Our Own Correspondent.

Once again the uncertainty of the European outlook has been the chief market factor this week; and once again it has had nothing but a firming tendency. Odd lots for this month are practically impossible to find, and scarce enough for February and March. Beyond that, collieries are rather inclined to hold whatever they have not yet sold, and uncertainty is restricting all but the most speculative buying.

There has, however, been a good turnover of business. The feature of the week has, perhaps, been the demand from France for all classes of coal. Inquiries earlier in the week, chiefly for railways, have, in the last few days, resulted in considerable quantities being placed, and merchants state that anything offering is quickly snapped up. Belgium has been a keen buyer of coking, and 26s. f.o.b. has been heard of as paid for not even best quality unscreened; while good-class smalls can easily get 25s. for prompt lots. Inquiries for Scandanavia for March have been round the market, and Italy for gas coals. German demand continues, though perhaps not so strongly as last week. It is chiefly for steam qualities, and business is hard to fix owing to exchange difficulties.

It is regrettable that an increase in home industrial demand during the week shows that much buying has been delayed until now. Instances are heard of in which iron and steel works were urged by collieries at the end of last year to take-in supplies; but they did not then see fit to do so. Now many of them have come on a bare market; and coal and coke are difficult to find, even at current prices, which are hardly calculated to assist the trade revival.

As regards gas coal in particular, there is a market report that one of the big London companies has bought up to a million tons for the year ending March, 1924, at prices near those forecasted here last week—viz., between 23s. 6d. and 24s. for Wear Specials, and 23s. and 23s. 6d. for best qualities. It is impossible to obtain confirmation or otherwise; but it is certain that they have put in inquiries, and that these would be the lowest prices asked.

Apart from this, it is hardly worth while to mention prices. They are "anything;" and, when second quality coking is quoted at 26s., specials and best quality gas should get well above this if collieries had any odd lots available. They mostly report being nearly fully booked for March, and are holding on for that month, and, generally speaking, for the rest of the year. Fitters are commonly talking of being within a few days of a 30s. market; but with the small quantities available, this is of little significance, except as indicating their confidence in the underlying strength.

YORKSHIRE AND LANCASHIRE COAL TRADE.

From a Local Correspondent.

The gas coal trade in Yorkshire and Lancashire remained practically unchanged last week, owing to the continued mildness of the weather. Prices were 19s. at the pit for screened, and about 19s. 6d. for gas nuts. The export demand for coke in Lancashire was maintained. At Hull, the prices of cargo for export f.o.b. Humber ports included 30s. 6d. for gas coke, and 30s. to 31s. for foundry furnace coke. The most interesting item in connection with the coal trade generally in Lancashire and Yorkshire is the purchase by Germany of 150,000 tons on the Hull market, and some participation by Lancashire in the Continental demand for coal. Hugo Stinnes has two agents acting for him in Hull, and the coal bought at this port by Germany is believed to be mainly on his account. The coal has been paid for in sterling in England. This coal is chiefly South Yorkshire best steam hards and slacks. One steamer was on Saturday chartered to Bremen from Hull at a freight of 5s. 7½d. per ton. The Lancashire trade is improving so far as industrial fuel is concerned. Gas and electricity are still taking a fair quantity; but the supply is equal to the demand. On the Leeds market gas coals are not in urgent demand, although they remain quite firm. At Barnsley gas coal is in fairly good demand, on large supplies. The coal trade generally in these two counties is rather upset owing to the events in the Ruhr Valley.

COAL TRADE IN THE MIDLANDS.

From a Local Correspondent.

While local collieries are slightly stiffening their quotations for industrial fuel, there is little change in the position of gas coal. Reports in the Daily Press that frantic demands are being made on the Yorkshire output to supply Continental deficiencies precipitated by the occupation of the Ruhr are viewed with scepticism by those in close contact with the pits. They state that if there is any expansion of the export demand its effect is so slight as to have made scarcely any impression on prices. A Yorkshire colliery quoting 6d. over the basis of current contracts lost a substantial order. No difficulty was experienced in getting requirements satisfied elsewhere without any question of an advance. Buyers say this is typical of the failure that has overtaken attempts to exploit the situation. There has been a widespread desire to stabilize values for the time being on the basis of last summer's contract prices. That buyers and sellers have co-operated to this end is strikingly shown by the absence of any revision, though in a large number of yearly contracts the right was reserved to either party to apply for a review at each quarter's end; the stipulation being that, in the event of failure to agree, deliveries should continue for another month at the original price, and that the contract should then be cancelled. It is recognized that the conflict in the Ruhr may prove a disturbing factor. Some middlemen say it is already tightening-up the market. Buyers generally are certainly not being stampeded. They are under no special pressure; the distributive system is working smoothly; and when occasion arises for extra purchases, summer contract prices have applied as a matter of course in the majority of cases.

CALORIFIC POWER AT A GLANCE.

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SOLE LICENSEES.

CURRENT SALES OF GAS PRODUCTS.

Tar Products in the Provinces.

Jan. 29.

The average values for gas-works products during last week were: Gas-works coal tar, 82s. to 87s. Pitch, East Coast, 137s. 6d. to 142s. 6d. f.o.b. West Coast—Manchester, 132s. 6d. to 137s. 6d.; Liverpool, 133s. 6d. to 138s. 6d.; Clyde, 135s. to 140s. Benzole 90 p.ct., North, 1s. 7½d. to 1s. 8d.; crude 65 p.ct. at 120° C., 1s. 0½d. to 1s. 1d. naked at makers' works; 50-90 p.ct., naked, North, 1s. 8d. to 1s. 8½d. Toluole, naked, North, 1s. 11d. to 2s. nominal. Coal tar crude naphtha in bulk, North, 8½d. to 9d. Solvent naphtha, naked, North, 1s. 8d. to 1s. 10d. Heavy naphtha, North, 1s. 6d. to 1s. 8d. Creosote, in bulk, North, liquid, 7½d. to 8d.; salty, 6⅝d. to 7½d. Scotland, 6½d to 6⅝d. Heavy oils, in bulk, North, 7d. to 7½d. Carbolic acid, 60 p.ct., 2s. 5d. to 2s. 7d. Naphthalene, £15 to £16; salts, £6 to £8, bags included. Anthracene, "A" quality, 4d. per minimum 40 p.ct., purely nominal; "B" unsaleable.

Manchester District Tar Prices.

The average price realized for the sale of tar in the Manchester district, according to the sliding-scale, for the month of December was £4 7s. 8·43d. per ton.

FROM A MARKET CORRESPONDENT.

Bye-Products Trade.

The market for tar products has remained fairly steady without much change in quotations. Pitch maintains its price, and patent fuel makers in South Wales are complaining that this high figure is seriously damaging their business. They believe that the high value is brought about by the large demand for pitch for road-making purposes, and have sent a deputation to the Government Department concerned with reference to the matter. Elsewhere there is good inquiry for carbolic acid crystals. Intermediate products do not alter very much.

The range of quotations is as follows:

Benzole: 90% London 1s. 8d., North 1s. 7d.

Crude Tar: 70s. to 72s. 6d. Refined tar, 40s. per barrel (free) on rail.

Pitch: London, 135s. per ton; East Coast, 140s. per ton; West Coast, 118s. to 125s., with Manchester 120s. per ton, and Glasgow 122s. 6d. per ton; South Wales, 137s. 6d. per ton.

Solvent Naphtha: London, 1s. 8d. Provinces average 1s. 7d. per gallon.

Crude Naphtha: Naked, 9d. per gallon.

Heavy Naphtha: 1s. 9d. per gallon.

Naphthalene: Refined, £17; inferior, £14; crude, £5 to £7 10s., according to quality.

Toluole: Naked, 2s. North, 1s. 11d.

Creosote: London, 7½d.; North, 7¼d.

Anthracene: 40-45%, 4d. per unit per cwt.

Pyridine: 12s. per gallon.

Aniline Oil: 10d. per lb., drums extra.

Aniline Salts: 10d. per lb.

Cresylic Acid: 95%, 2s. 4d. to 2s. 6d.; 97-99%, 2s. 7d. to 2s. 8d. per gallon *ex* works London, f.o.b. other ports.

Carbolic Acid: Crude 60%, 2s. 4d. per gallon; crystals 40%, 8d. to 8½d.

Salicylic Acid: Technical, 1s.; B.P., 1s. 6d. per lb.

Xylol: Pure, 3s. 3d.; commercial, 2s. 6d. per gallon.

Sulphate of Ammonia.

The home trade still continues of good volume at the fixed rates. Export trade is being effected at about £18 per ton.

Brentwood Capital Issue Over-Subscribed.—The issue of £23,457 of 6 p.ct redeemable preference stock in the Brentwood Gas Company, which Messrs. A. & W. Richards advertised in the pages of the "JOURNAL," was considerably over-subscribed—the total applications amounting to £39,750.

Tottenham Gas Company's Dividend.—The Directors of the Tottenham District Light, Heat, and Power Company recommend the payment of dividends in respect of the half year ended Dec. 31 at the rate of 5 p.ct. per annum on the preference stock, 8 p.ct. per annum on the "A" stock, and 6½ p.ct. per annum on the "B" stock—all less income-tax.

Manchester Corporation and Water Gas.—Interviewed by a "Daily Dispatch" representive, Sir William Kay, the Chairman of the Manchester Corporation Gas Committee, stated that in Manchester the gas leakage is not so serious as two years, or even six months, ago. Since the war, it had been the policy of the Committee steadily to decrease the percentage of carburetted water gas; and he predicted that in the near future it will be practically absent from the supply. As in pre-war years, it will be pure coal gas, and the carburetted water-gas plant will fulfil its original purpose. It was originally obtained to allow the department to meet a sudden demand for extra gas during the winter months, excessive fogs, or exceptionally dark weather. He stated it should be a matter of satisfaction to Manchester gas consumers to know that the loss by leakage from the Corporation mains has for a long time been steadily on the decrease. Fifteen years ago it represented some 10 p.ct. of the output. To-day it is less than 3 p.ct. The department had a record consumption for the week ended Dec. 23 last, of 179,343,000 c.ft., which represented an increase, for one week, of 4,000,000 c.ft.

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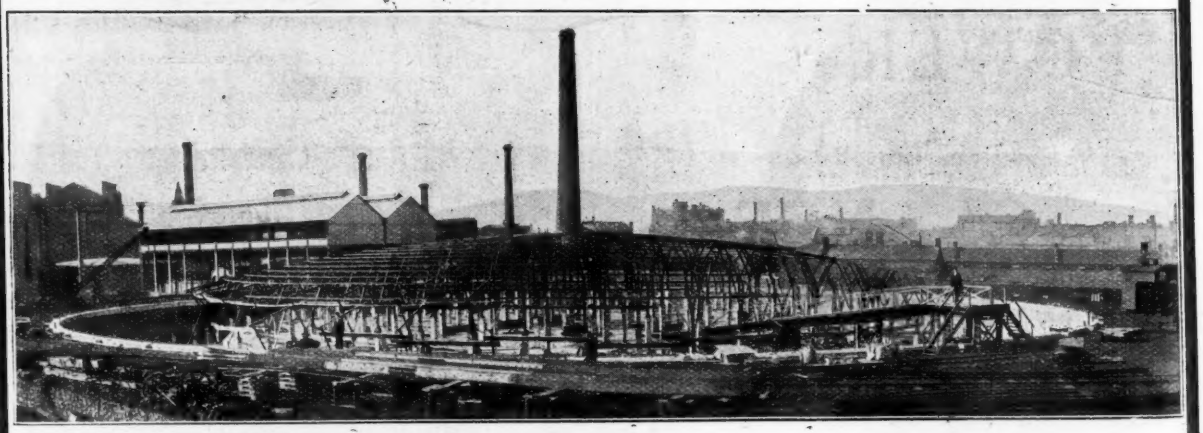

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STOCK MARKET REPORT.

The Stock Exchange opened under the pressure of our foreign entanglements and Continental sales. Then ensued a couple of calmer days, and buyers of popular lines came to the front. Thursday paused, the settlement of the account engrossing some time and attention, and sellers predominated on Friday.

Business in the Gas Market was about a match for the previous week's, but was better distributed. The tendency on the whole was decidedly good, although there were one or two retrograde movements. Gas Light ordinary was marked down ½; but actual prices did not suffer. Portsea "C" rose 10, Wandsworth "B" and Epsom 5 each, South Suburban 1, and South Metropolitan 3 p.ct. debenture 1. Brentford "A" and "B" fell 1 each, Imperial Continental debenture 2; but Primitiva 1911 debenture rose 2.

The following transactions in gas during the week were recorded: On Monday, Alliance and Dublin 64, Brentford "A" 100, ditto "B" 100½, Brighton and Hove original 165, ditto ordinary 122, Commercial 4 p.ct. 96, ditto 3 p.ct. debenture 57½, Croydon maximum dividend 83, Gas Light ordinary 93½, 93⅝, 94, 94½, 94½, ditto 3½ p.ct. maximum 64⅝, ditto 3 p.ct. debenture 61, Imperial Continental 157, ditto 3½ p.ct. debenture 75, 76½, Liverpool 7 p.ct. preference 106, 107, Monte Video 52, Primitiva 13s. 9d., 14s., ditto 5 p.ct. preference 54s. 4½d., 54s. 6d., River Plate 4 p.ct. debenture 55, 56, South Metropolitan 95½, ditto 6½ p.ct. debenture 105, 105⅝, 106, 106½, Hornsey 4 p.ct. debenture 79, 79½, Wolverhampton 10 p.ct. 128. On Tuesday, Brentford "B" 99, British 34½, Cape Town 4½ p.ct. preference 7, Continental Union 7 p.ct. preference 57½, Gas Light ordinary 93½, 93⅝, 93⅞, 94, ditto 3½ p.ct. maximum 64½, Imperial Continental 156, 156½, 158, Oriental 97½, Primitiva 5 p.ct. preference 52s. 9d., 54s. 4½d., 55s., 55s. 7½d., South Metropolitan 95, 95½, ditto 3 p.ct. debenture 60, Wolverhampton 10 p.ct. 129. On Wednesday, Bombay 94s. 1½d., Brentford "B" 99½, 100½, Brighton and Hove ordinary 123, British 4 p.ct. debenture 76, 76½, Commercial 4 p.ct. 95, Croydon sliding-scale 100, 101, European 8½, Gas Light ordinary 93½, 93⅝, 93⅞, 94, ditto 3½ p.ct. maximum 64⅝, ditto 3 p.ct. debenture 60, Imperial Continental 156½, 157½, 157⅝, Liverpool 7 p.ct. preference 105½, Monte Video 52, Oriental 98, Primitiva 5 p.ct. preference 52s. 6d., 53s. 1½d., 53s. 6d., 53s. 9d. ditto 4 p.ct. debenture 70½, 71, River Plate 4 p.ct. debenture 55½, 56, South Metropolitan 94½, 95⅝, ditto 3 p.ct. debenture 60, 60⅛, ditto 6½ p.ct. debenture 105⅝, Uxbridge and Wycombe 4 p.ct. debenture 73½, 74. On Thursday, Commercial 4 p.ct. 95½, European 8, Gas Light ordinary 93½, 93⅝, 93¾, 94, ditto 3 p.ct. debenture 62, Imperial Continental 156½. Portsea "C" 97, Primitiva 13s. 6d., ditto 5 p.ct. preference 52s. 6d., 54s., South Metropolitan 94½, ditto 3 p.ct. debenture 60½, 60⅝, ditto 6½ p.ct. debenture 105½, South Suburban 5 p.ct. debenture 95½, Wandsworth Wimbledon 98, Malta and Mediterranean 7 p.ct. preference 80s. On Friday, Brighton and Hove original 166, Continental Union 7 p.ct. preference 58, 59, European 8⅜, Gas Light ordinary 93½, 93⅝, 93½, 93⅝, 93¾, ditto 3½ p.ct. maximum 64, 64½, ditto 4 p.ct. preference 80, Hastings and St. Leonards 5 p.ct. 99, 99½, Hornsey 131, Primitiva 5 p.ct. preference 52s. 6d., South Metropolitan 94½, 94⅝, 95, 95½, Lewes original 94, 94½.

In the Money Market, there was a continuation of the remarkable superabundance demanding employment; but this was modified by occasional fluctuations of some demand. These, however, were soon disposed of, and excess of supplies marked the rest of the week. Discount rates were at first very easy, but later the price at which Treasury Bills came out, and a forecast of dearer money generally, made discount terms harder. Silver was weaker in the absence of Oriental demands. The Bank of England rate was 3 p.ct., as fixed on July 13.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S TRANSACTIONS.

Issue.	Share.	When ex-Dividend.	Ante-War Dividend & Bonus.	Last Dividend.	NAME.	Closing Prices, July 30, 1914.	Present Prices.	Lowest and Highest Prices of Transactions.
£			p.c.					
182,049	Stk.	Aug. 24	4	4%	Aldershot 4 p.c. Pref.	..	68—73	...
1,551,863	,,	Oct. 5	4	5%	Alliance & Dublin Ord.	59—64	62—67	64
374,000	,,	Jan. 11	4	4%	Do. 4 p.c. Deb.	76—79	60—65	...
280,000	5	Oct. 19	7½	4/-	Bombay, Ltd.	5⅞—6⅛	4½—5	94/1½
100,000	5	Aug. 10	16	7½%	Bournemouth Gas and Water: 5 p.c.	..	11—12	...
383,110	10	,,	7	7%	Bournemouth Gas and Water: B 7 p.c.	15—15½	11—12	...
115,000	10	,,	6	6%	Bournemouth Gas and Water: Pref. 6 p.c.	13½—14	9—10	...
162,065	—	Dec. 29	—	4%	Bournemouth Gas and Water: 4 p.c. Deb.	..	71—76	...
992,045	Stk.	July 27	14	6⅓/-	Brentford A Consolid.	261—266	99—102	100
734,920	,,	,,	11	6⅓/3	Do. B New	204—209	99—102	99—100½
55,000	,,	,,	5	5%	Do. 5 p.c. Pref.	109—111	82—87	...
221,400	,,	Dec. 14	4	4%	Do. 4 p.c. Deb.	91—93	75—80	...
214,775	,,	Aug. 24	11	11⅛%	Brighton & Hove Orig.	208—213	165—170	165—166
244,200	,,	,,	8	8⅛%	Do. A Ord. Stk.	154—159	120—125	122—123
1,287,500	Stk.	July 28	5	5%	Bristol 5 p.c. max.	..	95—96	...
530,000	20	Oct. 5	12½	22/6	British	44—45	34—35	34½
10,000	10	Dec. 29	—	7/-	Do. 7 p.c. Pref.	..	10½—11½	...
120,000	Stk.	June 29	4	4%	Do. 4 p.c. Deb. Stk.	88—90	75—80	76—76½
245,771	,,	Dec. 29	4	4%	Buenos Aires 4 p.c. Deb.	85—87	33—38	...
100,000	10	Nov. 2	—	—	Cape Town & Dis., Ltd.	1¾—2¼	6¾—7¼	...
100,000	10	Oct. 19	—	—	Do. 4½ p.c. Pref.	4—6	6—7	7
100,000	Stk.	Dec. 29	4½	—	Do. 4½ p.c. Deb. Stk.	70—75	71—76	...
237,860	,,	,,	—	7½%	Cardiff 7½ p.c. Deb.	..	102—104	...
157,150	,,	Feb. 26	5	5%	Chester 5 p.c. Ord.	108—110	..	...
1,513,280	,,	July 27	5/9/4	56/-	Commercial 4 p.c. Stk.	106—108	93—98	95—96
560,000	,,	,,	5½	55/-	Do. 3½ p.c. do.	103—105	93—98	...
475,000	,,	Dec. 14	3	3%	Do. 3 p.c. Deb. Stk.	69½—71½	55—60	57½
800,000	,,	Dec. 15	4	—	Continental Union, Ltd.	76—79	26—31	...
200,000	,,	Dec. 14	7	3%	Do. 7 p.c. Pref.	115—118	55—60	57½—59
660,000		Sept. 1	—	6%	Croydon sliding scale.	..	96—101	100—101
284,975		,,	—	5%	Do. max. div.	..	80—85	83
492,270	Stk.	—	6	4⅛%	Derby Con. Stk.	123—125	..	...
55,000	,,	—	4	4%	Do. Deb. Stk.	102—104	..	...
209,000	,,	Oct. 5	—	5%	East Hull 5 p.c. max.	..	..	...
1,002,180	10	Jan. 25	10	5/0	European, Ltd.	17½—18	8—9*	8—8⅛
16,298,975	Stk.	July 27	4/17/4	52/-	Gas: 4 p.c. Ord.	98—102	93—95	93½—94½
2,600,000	,,	,,	3½	35/-	Gas: 3½ p.c. max.	76—79	62—65	64—64½
4,062,235	,,	,,	4	4%	Light: 4 p.c. Con. Pref.	96—99	77—80	80
4,674,850	,,	Dec. 14	3	3%	and: 3 p.c. Con. Deb.	72½—74½	59—62	60—62
130,000	,,	Dec. 11	10	10%	Coke: 10 p.c. Bonds	..	..	...
	—	—	—	—	Coke: 7½ p.c. Ilford Deb.	..	..	...
82,500	,,	Sept. 21	5	65/7½	Hastings & St. L. 5 p.c.	..	95—100	99—99½
258,740	,,	,,	3½	50/7½	Do. 3½ p.c.	87—89	77—80	...
70,000	10	May 18	11	7½%	Hongkong & China, Ltd.	16½—16¾	6—7	...
86,600	Stk.	Aug. 24	9	9⅛%	Hornsey 7 p.c.	..	127—132	131
1,976,000	,,	Nov. 16	9	£5	Imperial Continental	150—160	155—160	156—158
404,800	,,	Aug. 10	3½	3½%	Do. 3½ p.c. Deb. Red.	84—86	76—79	75—76½
235,242	,,	July 27	6½	6½%	Lea Bridge Ord. 5 p.c.	119—121	95—100	...
2,498,905	,,	Feb. 26	10	37/6	Liverpool 5 p.c. Ord.	..	..	...
600,000	,,	Sept. 21	—	7%	,, 7 p.c. Pref.	..	105—107	105½—107
165,736	,,	Aug. 10	7/5/6	87/3	Maidstone 5 p.c.	..	87—92	...
63,480	,,	Dec. 29	—	3%	Do. 3 p.c. Deb	..	53—58	...
75,000	5	June 29	6	6%	Malta & Mediterranean Met. of Melbourne: 4½ p.c. Deb.	4⅛—4⅜	3¼—4	...
250,000	100	Oct. 2	4½	4½%	Monte Video, Ltd.	99—101	97—100	...
541,920	Stk.	Nov. 30	4	4%	Newcastle & Gatsh'dCon.	11½—12	52—57	52
1,875,892	,,	July 27	4½	4½%	Do. 4 p.c. Pref. Stk.	98½—99½	83½—84½	...
98,125	,,	,,	—	4%	Do. 3½ p.c. Deb.	..	76—78	...
529,705	,,	Dec. 29	3½	3½%	North Middlesex 10 p.c.	82—83	68—69	...
15,000	10	Aug. 26	—	7/6	,, ,, 7 p.c.	..	..	...
35,940	10	Aug. 24	7/14/0	7/8⅝	Oriental, Ltd.	14—15	10½—11½	...
300,000	Stk.	Nov. 30	8	8%	Plym'th & Stonh'se 5 p.c.	117—122	95—100	97½—98
188,120	Stk.	Dec. 29	—	72/6	Portsea Island, B	..	91—96	...
60,000	50	Aug. 24	13	65/-	Do. C	128—131	100—105	...
100,000	50	,,	12	60/-	Primitiva Ord.	118—121	96—99	97
249,980	5	—	8	—	Do. 5 p.c. Pref.	5½—6	2⅝—2¾	13/6—14/-
499,960	5	—	5	—	Do. 4 p.c. Deb.	4½—5	2½—2½	52/6—55/7½
521,600	100	Nov. 30	4	4%	Do. ,, ,, 1911	91—93	68—73	70½—71
600,000	Stk.	Jan. 25	4	4%	River Plate 4 p.c. Deb.	..	55—60*	...
346,198	,,	Dec. 29	4	4%	San Paulo: 6 p.c. Pref.	85—87	53—58	55—56
150,000	10	Sept. 21	6	6/-	San Paulo: 5 p.c. Deb.	10½—11	5¾—6¼	...
125,000	50	July 3	5	5%	Sheffield A	47—49	35—38	...
135,000	Stk.	Aug. 24	10	5%	Do. B	223—224	97—99	...
209,984	,,	,,	10	5%	Do. C	222—224	97—99	...
523,500	,,	,,	10	5%	Shrewsbury 5 p.c.	220—222	97—99	...
133,201	Stk.	Sept. 15	4	4%	South African	..	..	...
90,000	10	Nov. 2	9	7%	South Met. Ord.	10½—11½	7—9	...
6,609,895	Stk.	July 27	5/4/0	5%	Do. Red. Pref.	111—113	94—96	94½—95¾
250,000	,,	Jan. 11	—	5%	Do. 3 p.c. Deb.	..	94—96	...
1,895,445	,,	,,	3	3%	Do. 6½ p.c. Deb.	72½—74½	59—62	60—60½
734,000	,,	Sept. 7	—	6½%	South Shields Con. Stk.	..	105—107	105—106½
224,820	,,	Aug. 24	8½	8½%	S'th Suburb'n Ord. 5 p.c.	157—159	108—110	...
1,087,795	,,	,,	6	6%	Do. 5 p.c. Deb. Stk.	114—116	98—101	...
298,337	,,	Dec. 29	5	5%	Southampton Ord.	116—118	93—98	95½
647,740	,,	Nov. 2	5	7%	Do. 4 p.c. Deb. Stk.	99—102	80—83	...
121,275	,,	Dec. 29	4	4%	Swansea 7 p.c. Pref. Stk.	..	68—73	...
250,000	,,	Aug. 24	—	2 18	Do. 6½ p.c. Deb. Stk.	..	103—105	...
200,000	,,	Dec. 29	—	2 02	Tottenham: A 5 p.c.	..	101—103	...
120,000	,,	July 27	—	7½%	Tottenham: B 3½ p.c.	135—138	112—117	...
782,275	,,	,,	6	6%	Tottenham: 4 p.c. Deb.	115—117	100—103	...
181,255	,,	Dec. 14	4	4%	Tynemouth 5 p.c. max.	87—89	75—80	...
236,476	Stk.	Aug. 24	5	2½%	Wandsworth, Wimbledon, and Epsom—	108½—109	79—81	...
30,000	,,	July 27	8½	72/6	Wandsworth A 5 p.c.	151—156	111—115	...
155,636	,,	,,	6½	57/6	Do. B 3½ p.c.	129—134	100—105	...
108,575	,,	,,	—	50/9	Do. C	..	87—92	...
140,865	,,	,,	—	50/9	New Ordinary	..	87—92	...
352,000	,,	,,	6½	53/9	Wimbledon 5 p.c.	117—122	95—100	98
98,000	,,	,,	6½	58/9	Epsom 5 p.c.	121—126	100—105	...
88,416	,,	Dec. 29	3	3%	3 p.c Deb. Stk.	66—69	56—59	...

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Price of Gas at Darlington.—The Darlington Gas Committee have decided to recommend the Corporation to reduce the charges for gas by 5d. per 1000 c.ft., making the net price 2s. 9d. It is expected that the new charge will operate during the current quarter. It was also determined to ask the Council to reduce the price of coke from 30s. to 28s. 4d. per ton, and to sanction the construction of a new holder.

Smethwick Gas Powers.—It has been reported to the Smethwick Gas Committee that a Special Order has now been passed—the Smethwick Corporation Gas Order, 1922—whereby the powers of the Corporation in regard to the gas undertaking are considerably enhanced, and a number of useful provisions as to management secured. The Committee have placed on record their appreciation of the able and expeditious manner in which the matter has been carried through by the Town Clerk and his Deputy.

Price Reduction and Dividend at Wallsend.—The Directors of the Wallsend Union Gas Company have intimated a further reduction in the price of gas to 10d. per therm, to take effect as from the meter readings of December last. They have also resolved to recommend to the proprietors the payment of final dividends for the year upon the preference stock, 2½ p.ct., making 5 p.ct. for the year; upon the consolidated stock, 3½ p.ct., making 5¼ p.ct. for the year; and upon the ordinary stock, 4¼ p.ct., making 6¾ p.ct. for the year.

Dividend and Price at Newcastle.—The Directors of the Newcastle-upon-Tyne and Gateshead Gas Company have resolved to recommend to the proprietors, subject to audit, the payment of final dividends for the year ended Dec. 31 of 2 p.ct. upon the preference stock, making 4 p.ct. for the year, and 2⅝ p.ct. upon the ordinary stock, making 4⅛ p.ct. for the year. They have also announced that a further reduction in the price of gas will be made from the March readings of the meters. The amount of the reduction, however, has not yet been settled.

The Fleetwood Gas-Works Explosion.—The adjourned inquest was held at Fleetwood last Wednesday on John Henry Allen and Frederick Walton, who lost their lives in the recent explosion at Fleetwood Gas-Works. The evidence showed that workmen were clearing a pipe. One was holding a candle, when there was a sudden rush of gas, followed by the explosion. At the time the deceased were on the tap of the scrubber. It was alleged that there was no valve between the pipe and the scrubber, and that gas could therefore get into the pipe. A verdict of "Death from misadventure" was returned. The foreman said the jury did not think there was any criminal negligence on the part of anyone. Such dangerous operations as this, however, should only be undertaken by practical men working under competent supervision. The Gas Company were blameworthy in this respect.

Carbon Monoxide Poisoning Case at Brentford.—At a Brentford inquest on a young woman named Stone, it was stated that she was found dead on a bed in a room over one in which there was a gas-stove, and the ceiling of which had partly fallen down. All the taps in the house were turned off. Mr. George Jennings, Deputy Chief Inspector to the Gas Company, said that the carbon monoxide in their gas amounted to 17·98 p.ct. It was the same percentage as had been used for fifteen years, and for forty years there had been no death in Brentford through the Company's gas. Dr. Walter stated that there was a very strong smell of gas in the room. In addressing the Jury, the Coroner said he thought, as there were so many of these cases of gas poisoning, it was time the Legislature fixed the maximum of carbon monoxide there should be in gas. The Jury returned a verdict of "Death by misadventure," and exonerated the Gas Company from all blame.

Battersea Borough Council and Therm Inquiry.—The Law and General Purposes Committee of the Battersea Borough Council reported to that body at their meeting on Jan. 24 that a letter had been received from the Secretary to the Board of Trade Committee, asking whether the Council desired to give evidence before the Committee. They had, however, decided to leave the question of the submission of evidence on behalf of the gas consumers of London to the London County Council and the Metropolitan Borough Standing Joint Committee. The Council agreed.

Gas-Meter Testing Work at Manchester.—The Magistrates' Committee of Manchester, who have charge of the gas-meter testing station in that city, held their annual meeting last week, for the election of officers and other business. Great pleasure was expressed at the fact that the station is now in the happy position of being able to pay its way—a thing it has not done for many years, owing mainly to the blighting effects of the war. The Committee, with cordial recognition of their past services, re-appointed Mr. H. N. Barrow as Chairman, and Mr. Harold King as Vice-Chairman. The Manchester testing station, as gas engineers know, is a model of its kind, well furnished in every way. About 5000 meters are thoroughly tested every month. Mr. Barrow, who is the Manager of the Manchester branch of the well-known firm of James Russell & Sons, Ltd., wrought-iron tube manufacturers, thanked the meeting for its expressions of confidence.

An Industry United for Publicity.—Mr. W. M. Mason, Manager of the British Commercial Gas Association, lectured to the members of the Dorking and District Chamber of Commerce on Tuesday of last week, on the subject of "An Industry United for Publicity." As an object-lesson to all traders and business men, he referred to the advantages of the publicity campaigns initiated and carried through by the "B.C.G.A.," and said it was certainly curious that advertising was still regarded by some otherwise intelligent men as a sort of extravagance or supercharge on the business of distribution. Yet obviously it was exactly on all fours with the other normal charges, such as rent. To look upon advertising as a luxury was surely topsy-turvy thinking. The neglect of proper publicity methods had frequently led to business disaster. No business could attain its highest success unless the idea of service to patrons, customers, and the community was kept in the foreground.

In order to facilitate a supply of gas to Langho, the Blackburn Corporation Gas Committee have decided to lay a small independent high-pressure steel main from the holder in Addison Street to Brownhill.

The Parliamentary Committee of the Smethwick Corporation recommend that the Council oppose the Bill of the South Staffordshire Mond Gas (Power and Heating) Company, now being promoted in Parliament, if, in the opinion of the Town Clerk and Parliamentary Agents, such opposition is necessary.

In submitting to the shareholders next Monday the balance-sheet of the Sutherland Meter Company, Ltd., as on Dec. 31 last (which incorporates the effect of the scheme for reduction of capital adopted last May), the Directors will report that the profit on the year's trading, after making provision for income-tax, corporation profits tax, and depreciation, amounts to the sum of £3046, to which has to be added the balance brought forward from last year of £3157, making a total of £6203 to the credit of the revenue account. This the Directors recommend shall be dealt with by payment of the 7½ p.ct. preference dividend, and of a dividend on the ordinary shares at the rate of 5 p.ct., less tax—leaving to be carried forward £4285.

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